# HITACHI

Model V-550B

Oscilloscope

SERVICE MANUAL

Hitachi Denshi, Ltd.

CONTENTS

1. Specifications ..... 1

2. Composition ..... 6

3. Preventive Maintenance ..... 7

4. Calibration ..... 9

5. Disassembly illustration ..... 25

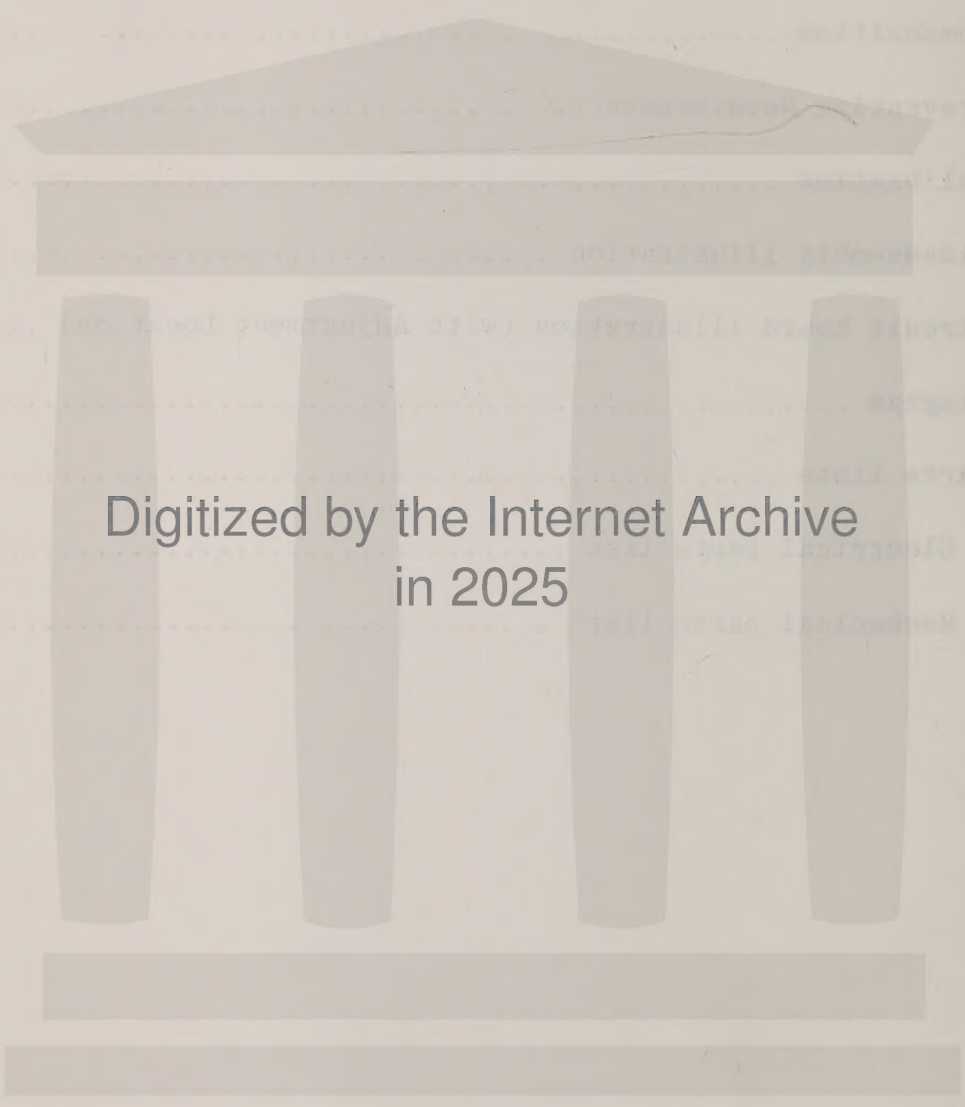
6. Circuit board illustration (with Adjustment Location) ... 27

7. Diagram ..... 29

8. Parts lists ..... 53

o Electrical parts list ..... 53

o Mechanical parts list ..... 100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# 1. SPECIFICATIONS

## o CRT

### Type

Hitachi 150BCB31 rectangular mesh type tube with 10 KV acceleration potential and metal backed phosphor

### Screen type

P31 (GH) phosphor standard

### Useful screen area

8 x 10 div

### Graticule

Internal graticule with centimeter divisions and 2mm subdivisions along the centeral axis 10% and 90% lines are indicated. Illumination continuously variable.

### Focussing

Possible (with automatic focus correction circuit)

| | |
|---|---|
| Trace rotation | Present |
| Scale illumination | Variable |
| Brightness adjustment | Possible |

## o Z-AXIS

DC-coupled, positive-going signal decreases intensity: 5Vp-p signal causes noticeable modulation at normal intensity: DC to 3.5MHz.

| | |
|---|---|
| Input impedance | Approximately 20 kΩ |
| Maximum input voltage | 50 V (DC + AC peak) |
| Coupling | DC |

o VERTICAL DEFLECTION (2 Identical Channels)

Bandwidth and Rise time

DC to at least 50MHz and rise time 7.0ns or less. DC to at least 10MHz and rise time 36ns or less at magnifier extends. Lower -3dB point, AC coupling 10Hz or less. 10x probe: 1Hz or less.

Deflection Factor

5mV/div to 5V/div in 10 calibrated steps, 1-2-5 sequence. Uncalibrated continuous control extends deflection factor to at least 12.5 Volts per division in the 5 Volts/div position. x5 magnifier increases sensitivity of each deflection factor setting to 1mV/div.

Accuracy

±3% (+10° C to +35° C)
±5% (0° C to +50 C)
Additional error for magnifier ±2%

Display modes

CH1, CH2 (normal or invert), Alternate, chopped (250kHz rate), Added

Input Impedance

1M ohm ±2% in parallel with 30pF approx

Maximum Input Voltage

250V (DC+ AC peak) or 500Vp-p AC at 1KHz or less

Input coupling

AC-GND-DC

Delay Line

Permits viewing leading edge of display waveform.

3rd Channel Display (A Trigger View)

Display simultaneously channel 1, channel 2, and external trigger signal. The deflection factor is approx 200mV/div.

| | |
|---|---|
| Sensitivity | INT: 1/1 ± 30% of screen area |
| | EXT: 0.2 V/div ± 30% |
| Frequency band | EXT: DC to 50 MHz (-3dB) |
| Position | Screen center ± 2 div (trigger level knob is set at the center) |

o HORIZONTAL DEFLECTION

Time Base A

50ns/div to 0.5s/div in 22 calibrated steps, 1-2-5 sequence. Uncalibrated continuous control extends deflection factor to at least 1.25 seconds per division in the 0.5 sec/div position. 10x mag extends fastest sweep rate to 5ns/div.

Time Base B

50ns/div to 50ms/div in 19 calibrated steps 1-2-5 sequence. 10x mag extends fastest sweep rate to 5ns/div.

Accuracy

±3% (+10°C to +35 C)

±5% (0 C to +50°C)

Additional error for magnifier ±2%

Horizontal Display Modes

A only, A intensified, B delayed, X-Y

| | |
|---|---|
| Calibrated Sweep Delay | Continuous calibrated control between 0.5 and 10× time base A setting. |
| Delay Time Jitter | Better than 1:20,000 |

o TRIGGERING A AND B

A Trigger Modes

Automatic, Normal, Single sweep, TV-V, TV-H

A Trigger Hold-off

Adjustable control permits a stable presentation of repetitive comples waveform.

A Trigger Source

Internal (Ch1, Ch2), Line, External.

A Trigger Slope

+ or -

Triggering level variable range — For both A and B. Internal; 4div or more. External; approximately ± 2V

Triggering sensitivity and frequency — For both A and B. However, ( ) is only for B

| Frequency | Internal | External |
|---|---|---|
| DC(30Hz) ~ 10MHz | 0.5 div | 150 mV |
| 10 MHz ~ 50MHz | 1.5 div | 500 mV |

TV-V sensitivity: SYNC section less than 0.7div or 200mV

AUTO low band : Approximately 30Hz

A Trigger Coupling

AC : 30Hz to full bandwidth

HF REJ: attenuates signals below approx 4KHz

LF REJ: attenuates signals above approx 4KHz

DC : 0 to full bandwidth

A External Trigger Input Impedance

1M ohm ±20% in parallel with $30_{PF}$ approx (However, setting HF REJ and LF REJ are not included.)

Maximum Input Voltage

250V (DC+ AC peak)

500Vp-p AC at 1KHz or less

B Trigger Modes and Source

Automatic, Normal (Internal, External)

B Trigger Slope

+ or -

Trigger Coupling

AC only; 30Hz to full bandwidth

o X-Y OPERATION (CH1; Horiz, CH2; Vert)

Deflection Factor

Same as vertical deflection

Accuracy

Y: ±3% (+10°C to +35 C), ±5% (0°C to +50°C)

X: ±5% (+10°C to +35°C), ±7% (0°C to +50°C)

Additional error for magnifier ±2%

X-Bandwidth

DC to at least 500kHz

Phase Error

3° or less from DC to 50kHz

o CALIBRATOR

0.5V±1% Frequency 1kHz±5% square wave

Rise time 5μs or less

o POWER SUPPLY

| VOLTAGE (50/60Hz) | FUSE |
|---|---|
| 100 V ( 90 ~ 110 V) | 2A |
| 120 V (108 ~ 132 V) | 2A |
| 220 V (198 ~ 242 V) | 1A |
| 240 V (216 ~ 264 V) | 1A |

Nominal voltage ± 5% at 400Hz

Power supply frequency. 50, 60, 400Hz

Power consumption Approximately 45W

o ENVIRONMENT

| | |
|---|---|
| Operating ambient temperature | 0° C ~ 50° C |
| Operating ambient humidity | 35% ~ 85% |
| Specification guaranteed ambient temperature | 10° C ~ 35° C |
| Specification guaranteed ambient humidity | 45% ~ 85% |

o DIMENSION AND WEIGHT

310w x 180h x 410d mm
(12.2w x 7.1h x 16.1d in)
9.3kg (22lb)

2. COMPOSITION

(1) Model V-550B oscilloscope unit.....1
(2) Probe (AT-10AD 1.5).....2
(3) Fuse (2A for 100V and 120V set
or 1A for 220V and 240V set).....1
(4) Dust proof cover.....1
(5) Power supply cord.....1
(6) Operation Manual.....1

## 3. PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the oscilloscope. The severity of environment to which this instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

### Disassembly

Remove the 4 screws in the top cover of the instrument. Gently separate the top cover from the instrument and lay aside. Most of the internal parts of the instrument are now accessible.

If access to the front of the circuit boards are necessary, remove the knobs from the external control shafts on the board. Remove the two screws securing the side panel to the Input circuit board and remove the instrument side panel. (See 5. DISASSEMBLY ILLUSTRATION.)

### Cleaning

The instrument should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause component breakdown.

The covers provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush.

Dirt that remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

Cleaning the interior should only be occasionally necessary. The best way to clean the interior is to blow off the dust with a dry, low-velocity stream of air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate components.

## Visual Inspection

The instrument should be inspected occasionally for such defects as broken connections, improperly seated transistors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparant; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, correcting the cause of the overheating is important to prevent recurrance of the damage.

## 4. CALIBRATION.

Hitachi Denshi, Ltd. provides complete instrument repair and recalibration at our oversea's office, and authorized dealer. Contact your local Hitachi Denshi, Ltd. office or representative.

### 4.1 TEST EQUIPMENT REQUIRED

The following test equipment and accessories, or equivalent, are required for the complete calibration of the V-550. The given specifications for the test equipment are the minumum necessary for accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. All the test equipment is assumed to be correctly calibrated and operating within the listed specification. Operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Table 4-1

TEST EQUIPMENT REQUIRED

| Description | Minimum Specification | Usage | Examples of Applicable Test Equipment |
|---|---|---|---|
| 1. Constant Amplitude Signal Generator | 50kHz reference frequency; maximum frequency 70MHz; variable amplitude. | Check horizontal, vertical and trigger bandwidth. | |
| 2. Standard Amplitude Calibrator | Amplitude accuracy: 0.25%, variable amplitude; 5mV to 40 V; frequency: 1 kHz squre wave. | Check horizontal and vertical gain. | |
| 3. Square-wave Generator | Variable frequency: 10 Hz to 1 MHz; output amplitude; 10 mV to 100 V. | Check probe and vertical compensation. | |
| 4. Digital Multimeter | 0.1% accuracy. | Check power supply | |
| 5. Time Mark Generator | 0.1% accuracy. | Check horizontal timing. | |
| 6. Cable | Impedance, 50 ohms; type, RG-58/U; length, 42 inches, connectors, BNC | External trigger operation check. Horizontal gain check and adjustment. | Hitachi Part No.4202 |
| 7. Termination | Impedance, 50 ohms; connectors, BNC | Vertical Amplifier compensation checks and adjustment. | Hitachi Part No.1401 |
| 8. Attenuator | Ratio, 10X; connectors, BNC; impedance, 50 ohms. | Vertical Amplifier bandwidth check. | Hitachi Part No.1501 |
| 9. T-Connector | Connectors, BNC. | External trigger operation checks. | Hitachi Part No.1301 |

## 4.2 PRELIMINARY PROCEDURE

This instrument should be calibrated at an ambient temperature of +20°C (±5°C) for best overall accurary.

1. Connect the instrument to AC line voltage, 50/60/400 Hz line source.
2. Set the instrument controls as given in the Preliminary Control Settings. Allow at least fifteen minutes of warmup before proceeding.
3. See the Adjustment Locations in the pullout pages.

## 4.3 PRELIMINARY CONTROL SETTINGS

Preset the instrument controls to the settings given below, when starting the calibration procedures.

| | | | |
|---|---|---|---|
| FOCUS | Midrange | FINE | Midrange |
| TRACE ROTATION | As desired | VAR HOLD OFF | Fully counterclockwise |
| V. POSITION | Midrange, push in | SWP VAR | Fully counterclockwise, push in |
| V. VARIABLE | CAL, fully clockwise | DISPLAY | A |
| AC-GND-DC | GND | - B TRIG - | |
| VOLTS/DIV | 5mV/DIV | SOURCE | AUTO |
| V. MODE | CH1 | LEVEL | Midrange, push in |
| TRIPLE | Normal (Button Out) | - A TRIG - | |
| INV | Normal (Button Out) | LEVEL | Midrange, push in |
| SCALE ILLUM | Fully counterclockwise | RESET | Normal |
| H. POSITION | Midrange | MODE | Auto |
| PULL X10 MAG | Midrange, push in | COUPLING | AC |
| TIME/DIV A | 1mS | SOURCE | CH1 |
| DLY TIME MULT | Midrange | | |

## 4.4 INITIAL STARTING PROCEDURE

1. Rotate POWER/INTENSITY control to the midrange.
2. Wait a few seconds for the cathode ray tube (CRT) to warm up. A trace should appear on the display of the CRT.
3. If trace disappears, increase (clockwise) the POWER/INTENSITY control setting until the trace is easily observed.
4. Adjust FOCUS control for the best focused display.
5. Readjust POSITION controls if necessary, to center the trace.

### POWER SUPPLY SYSTEM

NOTE

Before you begin, see ADJUSTMENT LOCATIONS in the pullout pages.

Control Settings

Preset the controls as given in the Preliminary Control Setting.

1-(1) Check Low-voltage Supply, if necessary

a. Connect the digital voltmeter (DVM) from the +12 volt line.
: +11.975 V to +12.025 V (IC 1111)

b. Connect the DVM from the -12 V line
: -11.75 V to -12.25 V (IC 1121)

c. Connect the DVM from the +5V line
: +4.75 V to +5.25 V (IC 1131)

d. Connect the DVM from the +99 V
: +97 V to +101 V(TR1101-Emitter)

e. Connect the DVM from the 150 V
: +140 V to +160 V

1-(2) Adjust Low-voltage Supply

Adjust the adjustment RV1111 for DVM reading of +12V ($\pm$0.025V).

2. Check High Voltage Supply

a. Connect the DVM to the H.V test point (D1024-Kathode) by High Voltage Probe.

b. Check for a reading of -1405 V ~ -1495 V

## DISPLAY

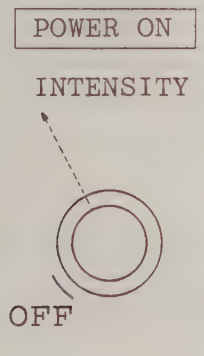
Control Setting

Preset the controls as given in the Preliminary Control Setting.

3. Check/Adjust Grid Bias

a. DISPLAY switch to the [X-Y] position, and Vertical Mode switch to the CH2 [X-Y] position.

b. Rotate the POWER/INTENSITY to the "I" letter of the "INTENSITY" as shown.




c. When small spot appears, use the POSITION control to place spot at center of screen.

d. Adjust Grid Bias Adjustment RV1021 to obtain small, round spot.

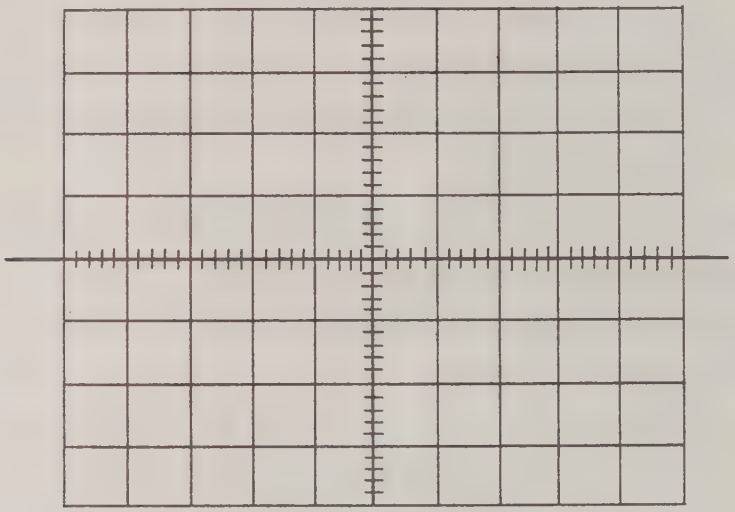
4. Check/Adjust Trace Rotation

a. Set the A TIME/DIV switch to 1mS.

b. Check that the trace is parallel to the center horizontal line.

c. DISPLAY switch to the A position.

d. Adjust TRACE ROTATION for a trace that is parallel with the horizontal graticule lines.



5. Check/Adjust GEOMetry

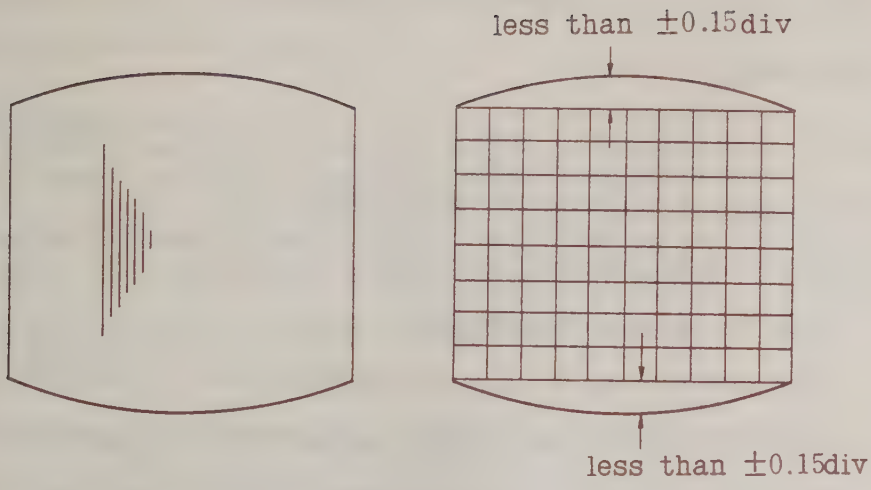
a. Set the A TIME/DIV switch to the 1mS,and AC-GND-DC to DC.

b. Connect the Constant Amplitude Signal Generator to the input.

c. Set the VOLTS/DIV switch setting for a full-screen (8 division) deflection.

d. Check that horizontal bowing is less than $\pm$0.15 division.

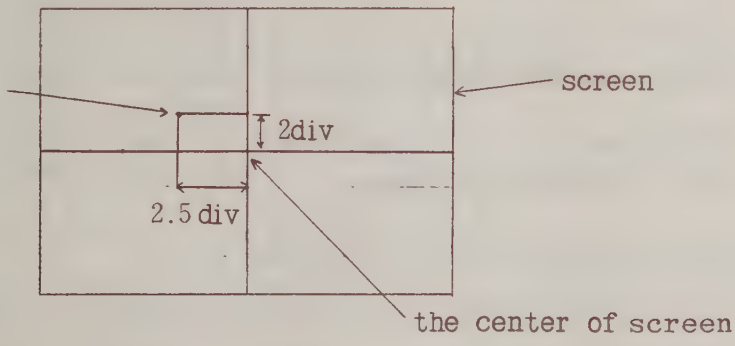
e. Adjust the GEOM adjustment RV1033 for a display that is parallel with top and bottom horizontal lines.




6. Check/Adjust ASTIGmatism and FOCUS.

   a. Vertical Mode switch to the CH2 [X-Y] position, and Display switch to the [X-Y] position, and AC-GND-DC to DC.

   b. Set the [POWER ON] INTENSITY control for a small spot, as the following figure, using position controls.




   c. Check that the spot is round.

   d. Adjust the FOCUS adjustment and the ASTIG adjustment RV1032 for a round spot.

## HORIZONTAL SYSTEM

### Control Settings

Preset the controls as given in the Preliminary Control settings.

7. Check/Adjust Horizontal Gain (Sweep Cal.)
   a. Set the A TIME/DIV switch to the 1mS.
   b. Set the input AC-GND-DC to DC.
   c. DISPLAY switch to the A position.
   d. Connect the cable to the output of the time mark generator.
   e. Set the time mark generator for 1mS time marks.
   f. Check that the time marks align with the graticule lines over the center eight divisions.
   g. Adjust H GAIN adjustment RV830 so that the time marks align with the center eight graticule lines.
   h. Check all other ranges of timing within 3%. Use appropriate settings on the time mark generator.
   i. DISPLAY switch to the B position, set the A TIME/DIV switch to the 2mS and the B TIME/DIV switch to the 1mS.
   j. Refer part (e) through (h) (in this case, adjust B Sweep CAL adjustment RV734).

8. Check/Adjust Horizontal X10 MAG Gain
   a. Set X10 MAG (Pull out the inner knob of the POSITION control).
   b. Refer item 5 part (a) through (e).
   c. Adjust MAG GAIN adjustment RV831 for one-cycle time marks align with the ten-divisions graticule lines.

d. Push in the inner of the POSITION control after the adjustment and check.

9. Check/Adjust MAG CENT.

a. Set the A TIME/DIV switch to the 0.1mS.

b. Being the inner shuft of H. POSITION is in pulled out state (X10 MAG), the left end of the trace is brought to the center point and then the inner shuft of H. POSITION is depressed.

c. Observe the movement of the left end of the trace.

d. Adjust the MAG CENT Adjustment RV842 for the movement of the left end of the trace within $\pm$0.2 div.

10. Check/Adjust High speed sweep accuracy.

a. Set the A TIME/DIV switch to 0.1 $\mu$ S.

b. Refer item 5 part (b) through (d).

c. Set the time mark generator for 0.1 $\mu$ S time marks.

d. Refer item 5 part (f).

e. Adjust CV514 at that the time marks align with center eight graticule lines.

f. Refer item 5 part (h).

g. DISPLAY switch to the B position.

h. Set the A TIME/DIV switch to the 0.5 $\mu$ S and the B TIME/DIV switch to the 0.1 $\mu$ S.

i. Refer part (c) through (f) (in this case, adjust CV 701).

j. Set the A TIME/DIV switch to 10 $\mu$ S.

k. Refer part (b).

l. Set the time mark generator for 10 $\mu$ S time marks.

m. Refer (d) through (f) (in this case, adjust CV 564.

n. DISPLAY switch to the B position.

o. Set the A TIME/DIV switch to the 50 $\mu$S, and the B TIME/DIV switch to the 10 $\mu$S.

p. Refer (h) through (i) (in this case, adjust CV729).

11. Check/Adjust Delay time

a. Set the A TIME/DIV switch to 1mS, and the B TIME/DIV switch to 1$\mu$S.

b. Set the DISPLAY switch to INTEN position.

c. Connect the cable to the output of the time mark generator.

d. Set the time mark generator for 1mS time marks.

e. Check that the reading of the DLY TIME MULT dial is 0.3 when the dial is fully counterclockwise.

f. Set the DLY TIME MULT dial to 1.0.

g. Check that the second time mark is bright.

h. Adjust RV556 so that the second time mark is bright when the dial reading is 1.0.

i. Set the dial to 9.0.

j. Check that the tenth time mark is bright.

k. Adjust RV555 so that the tenth time mark is bright when the dial reading is 9.0.

## VERTICAL SYSTEM

Control Setting

Preset the controls as given in the Preliminary Control Settings.

12. Check/Adjust DC Balance (Step attenuator balance).

a. Set the VOLTS/DIV switch to the 5mV position.

b. Position the trace to the horizontal center line.

c. Change the VOLTS/DIV switch to the 10mV position.

d. Check that the trace is within 0.1 division of the center horizontal line.

e. Adjust the CH1(CH2) ATT BAL adjustment, RV27(CH1) or RV127(CH2), for a trace at the horizontal center line.

f. Repeat part (a) through (e) until less than 0.1 division shift is noted when changing the VOLTS/DIV setting.

13. Check/Adjust Vertical Position Center.

a. Confirm the vertical POSITION control at the midrange.

b. Check the trace is within 1 division.

c. Adjust the Position Center adjustment RV97(CH1), RV197(CH2) for a trace at the horizontal center line.

14. Check/Adjust X1 AC GAIN.

a. Set the A TIME/DIV switch to the 1mS position.

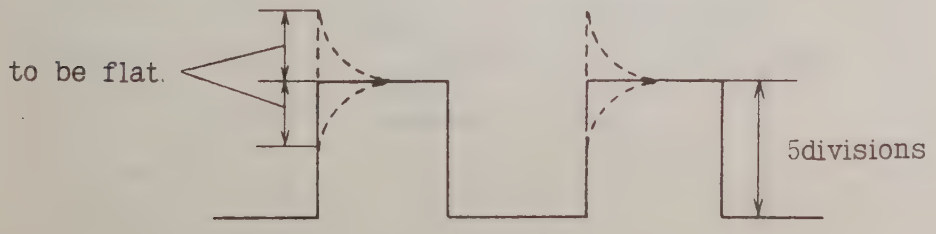
b. Set the VOLTS/DIV switch to the 10mV position.

c. Set the AC-GND-DC switch to DC.

d. Connect the Square-wave Generator (using 1KHz out put range).

e. Adjust the output amplitude of that generator for 5 division deflection of screen.

f. Check the high-voltage level of pulse is flat.



g. Adjust the X1 AC GAIN RV33(CH1), RV133(CH2) adjustment for a flat level.

15. Check/Adjust Vertical Gain.

a. Set the A VOLTS/DIV switch to the 10mV position and AC-GND-DC switch to DC.

b. Connect the standard amplitude calibrator to the input.

c. Set the standard amplitude calibrator for a $50mV_{p-p}$ (5 divisions of display) signal.

d. Check for a display of five divisions.

e. Adjust GAIN adjustment RV84(CH1), RV184(CH2) for a display of 5 divisions within 3%.

f. Check all the VOLTS/DIV switch settings.

16. Check/Adjust Vertical Step Response.

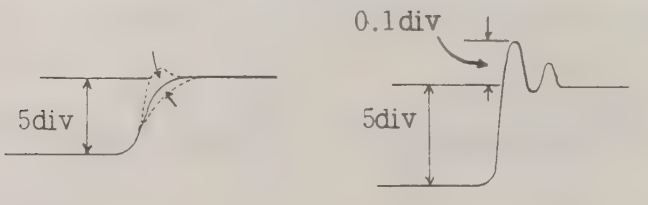
a. Set the VOLTS/DIV switch to the 10mV position.

b. Set the A TIME/DIV switch to the 0.5 $\mu$S position.

c. Connect the fast-rise, positive output (50mV, 1MHz) of the square-wave generator to input. Use a 50-ohm termination and cable.

d. Set the square-wave generator to 1MHz. Adjust the square-wave generator output for a 5-divisions display.

f. Adjust CV329 (at A TIME/DIV:0.2 $\mu$S), CV322 (at 0.1 $\mu$S) for a square wave that is flat.
And Adjust CV304(CH1) (at A TIME/DIV:50nS), CV182(CH2) (at A TIME/DIV:50nS) for over-shoot that is +0.1div.



17. Check/Adjust Attenuation Compensation.

a. Set the VOLTS/DIV switch to the 0.1V position and AC-GND-DC switch to DC.

b. Connect the square-wave generator to the input for a 0.5V signal.

c. Check for a square wave that is flat (flat top).

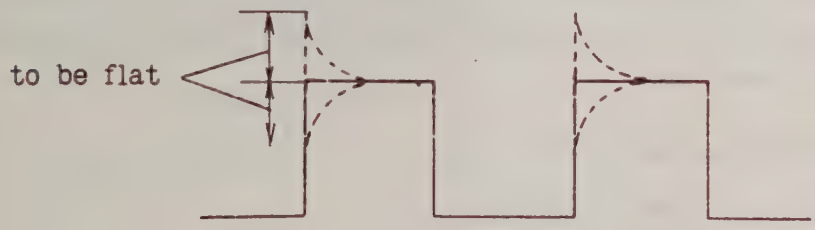
d. Adjust CV7(CH1), CV107(CH2) for a square wave that is flat (flat top).

e. Set the VOLTS/DIV switch to the 1V position.

f. Set the square-wave generator for a 5V signal.

g. Check for a square wave that is flat.

h. Adjust CV12(CH1), CV112(CH2) for a square wave that is flat.




18. Check/Adjust Input Capacity

a. Connect the L-C meter to Input terminal.

b. Check the Input capacity for a approximately 30pF.

c. Adjust the following trimmer condenser for a 30pF Input capacity under the following settings.

| ATT | VOLT/DIV | Adjust | |
|---|---|---|---|
| | | CH1 | CH2 |
| ÷ 1 | 10mV | CV22 | CV122 |
| ÷ 10 | 0.1V | CV6 | CV106 |
| ÷ 100 | 1V | CV11 | CV111 |

19. Check/Adjust TRIG CENT

a. Set A TRIG SOURCE switch to CH1, A TRIG COUPLING switch to AC, A TRIG SLOPE knob push in, the VOLTS/DIV switch to 50mV, the A TIME/DIV switch to 20μs.

b. Connect the sine-wave generator to the input for a 0.5div (50kHz).

c. Set TRIG LEVEL knob so that synchronization is effected on the waveform, 0.5div on the screen.

d. Under the state of (C), if synchronization is not effected by switching A TRIG COUPLING to "DC", set CH1(CH2) TRIG BAL RV64 (CH1) and RV164 (CH2) so that synchronization is effected.

e. Next, set A TRIG SLOPE to -(pulled out state) and insure that synchronization is effected. After confirmation, leave A TRIG-SLOPE in depressed state. Readjust when stepped out.

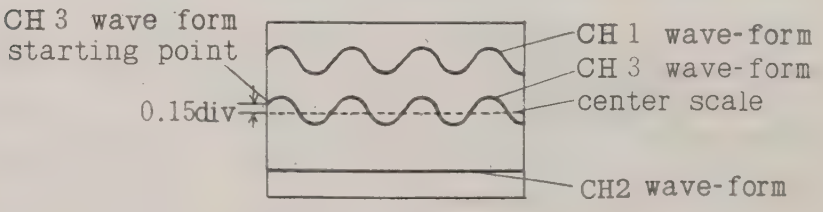
20. Check/Adjust CH3 CENT

a. Set the V MODE switch to ALT.

b. Push the TRIPLE switch on.

c. Check the initial point of CH3 waveform sweep is identical with the center horizontal division.

d. Adjust the CH3 CENT adjustment RV204 so that the starting point of CH3 waveform comes to the 0.15 div on the center horizon scale.



21. Check/Adjust EXT TRIG Step Response.

a. Set the A TRIG SOURCE switch to the EXT position, the A COUPLING switch to the DC point, the A MODE switch to the AUTO position, the B TRIG SOURCE switch to the EXT position, and push the TRIPLE switch in.

b. Connect the square-wave Generator (using 1kHz out put range) to A EXT TRIG terminal. Use a 50-ohm termination and cable.

c. Check the high-voltage level of pulse is flat.

e. Adjust CV402 for a flat level.

22. X-Y Operation

22-1. Check/Adjust X Gain.

a. Set the vertical MODE Switch to CH2 [X-Y], the DISPLAY switch to [X-Y], the AC-GND-DC switch of CH1 to DC, the AC-GND-DC switch of CH2 to GND.

b. Set the VOLTS/DIV switch to the 10mV position, with X1 GAIN.

c. Connect the standard amplitude calibrator to the CH1 input.

d. Set the standard amplitude calibrator for a 50mV.

e. Check for a display of 5 divisions.

f. Adjust the X GAIN adjustment RV591 for a display of 5 divisions.

22-2. Check/Adjust X Position Center

a. Set the DISPLAY switch to [X-Y] position, the vertical MODE switch to CH2/ [X-Y] position and the horizontal POSITION control to midposition, the AC-GND-DC switch of CH1 to GND.

b. Check to see that round spot is near the center graticule and is within 0.2 division against horizontal line.

c. Adjust the X CENT adjustment RV590 to position spot at the center.

23. Check/Adjust CAL terminal ($0.5V_{p-p}$, 1kHz)

a. Set the VOLTS/DIV switch to the 0.1V position, the A TIME/DIV switch to the 1mS.

b. Connect the CAL to the input.

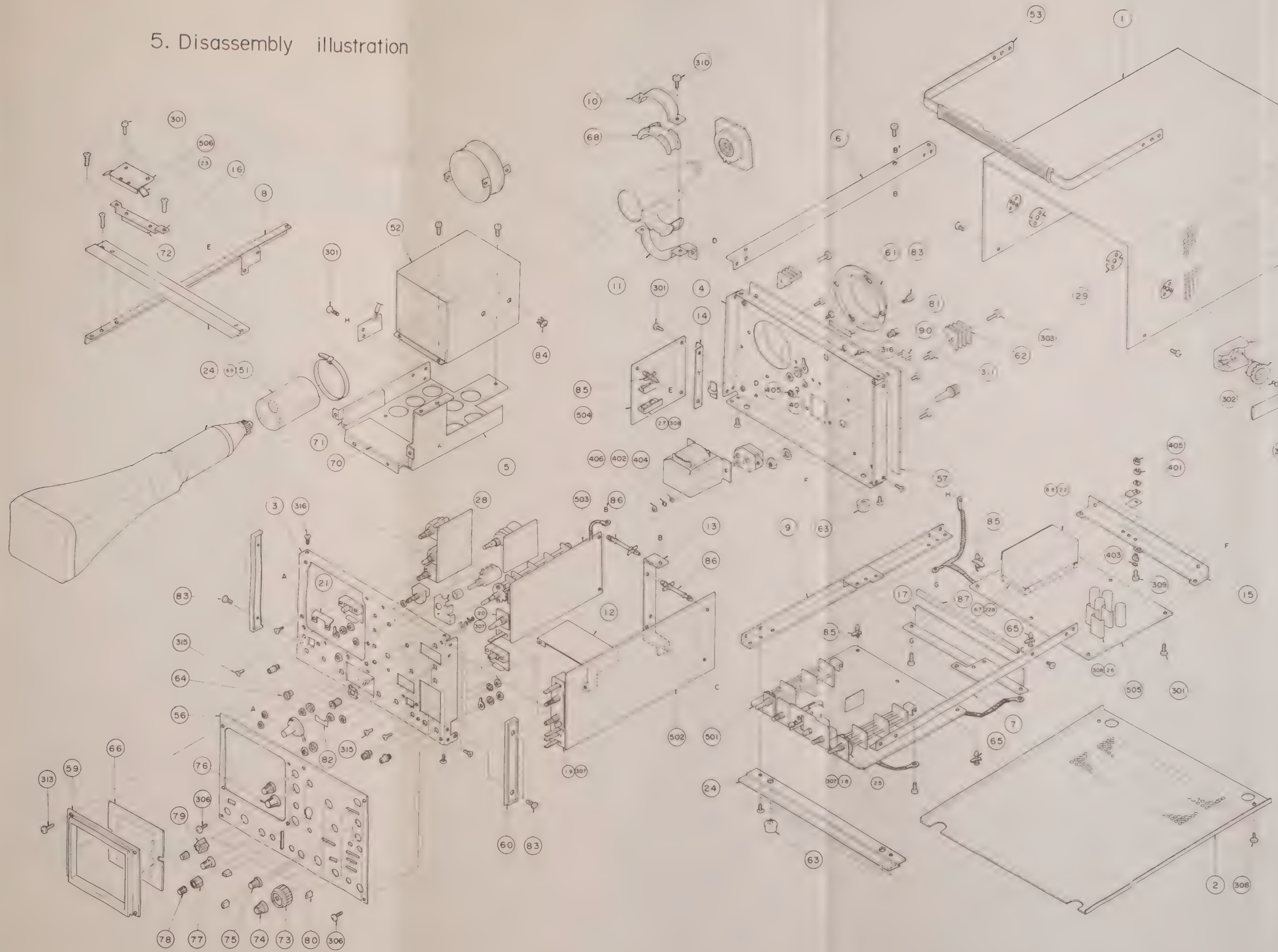
c. Check the deflection of 10th div on the screen is 0 as 1 period is 1div.

d. Adjust RV1203 for the deflection of 10th div on screen.

e. Check for a display of five divisions.

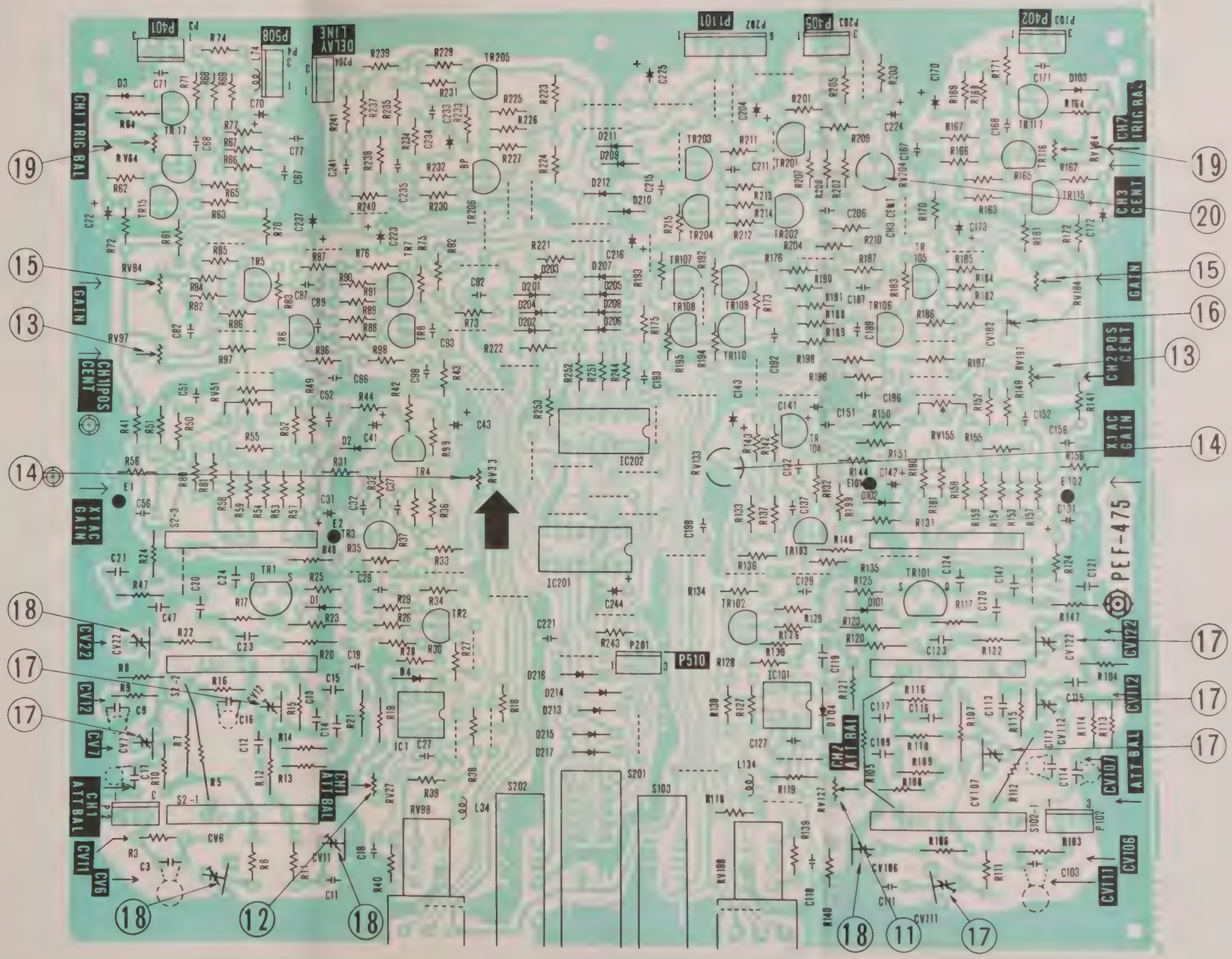
f. Adjust RV1205 for a display of 5 divisions within 1%.

## 5. Disassembly illustration



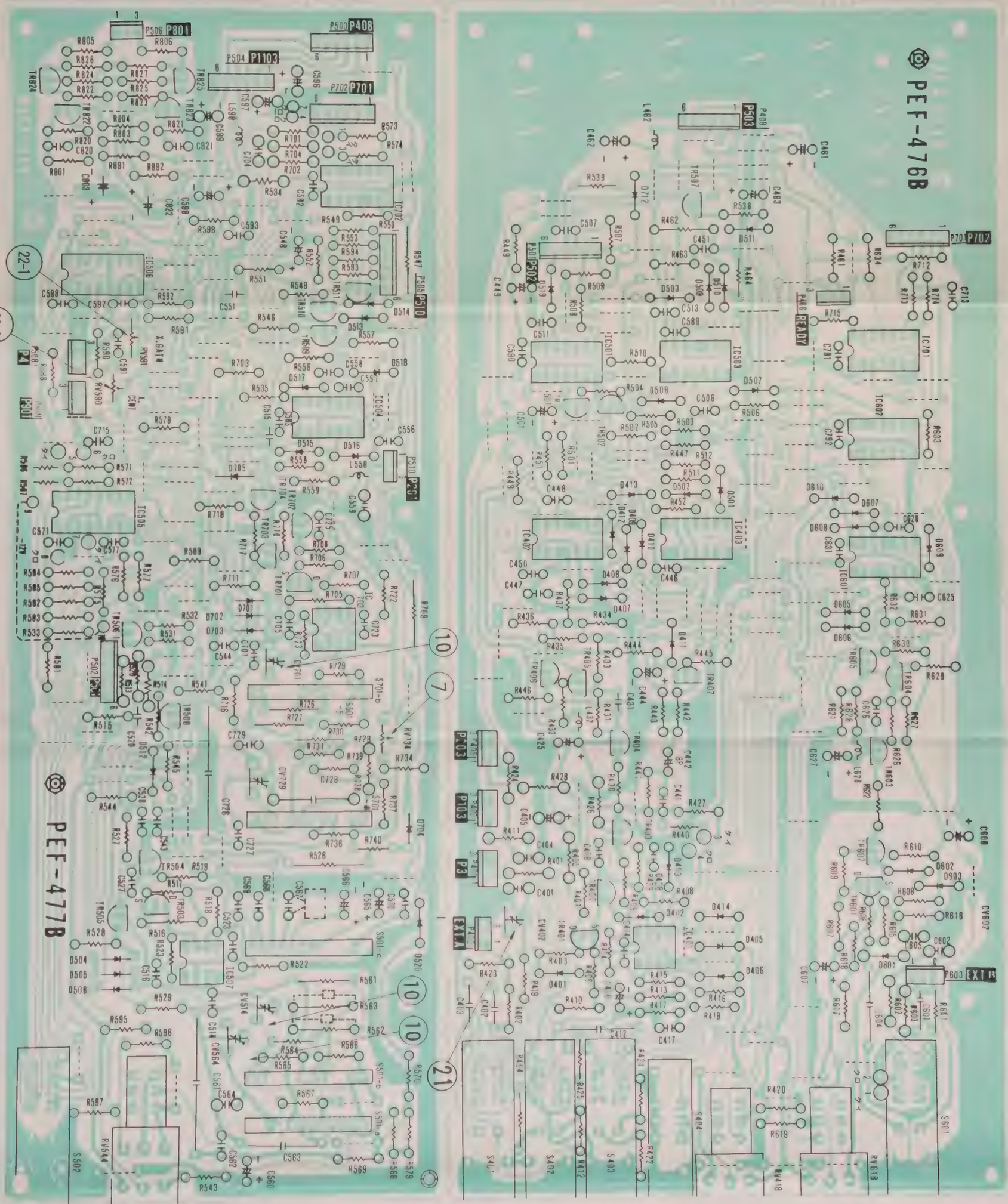
# 6. CIRCUIT BOARD ILLUSTRATION

(with Adjustment Location)


CH1 TRIG BAL
GAIN
CH1 POS CENT
X1AC GAIN
CH1 ATT BAL
CH2 TRIG BAL
CH3 CENT
CH2 POS CENT
X1AC GAIN
CH2 ATT BAL
ATT BAL
DELAY LINE
P401
P508
P1101
P402
P510
P102
PEF-475
19
15
13
14
18
17
12
11
20
16

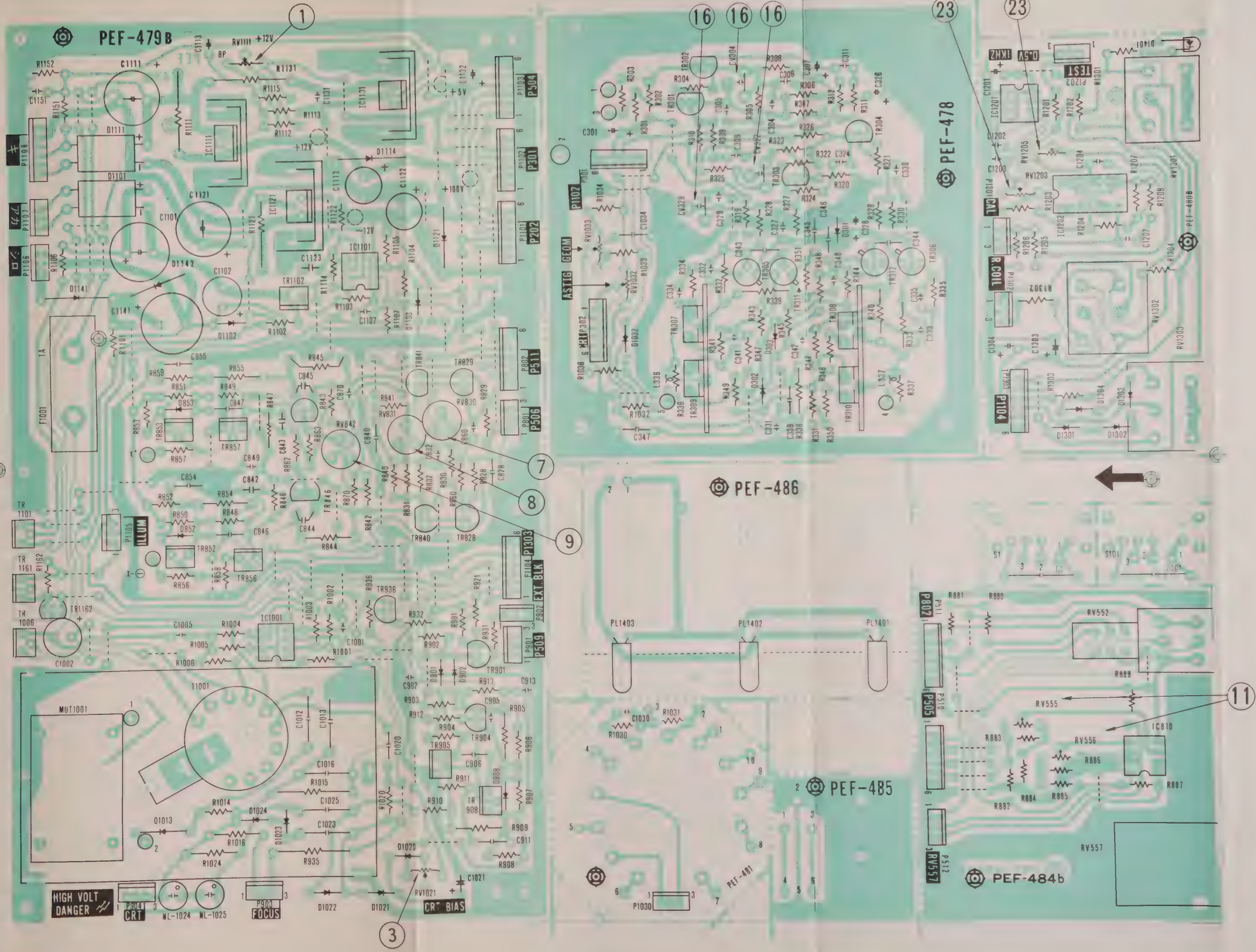
PEF-478

PEF-476B



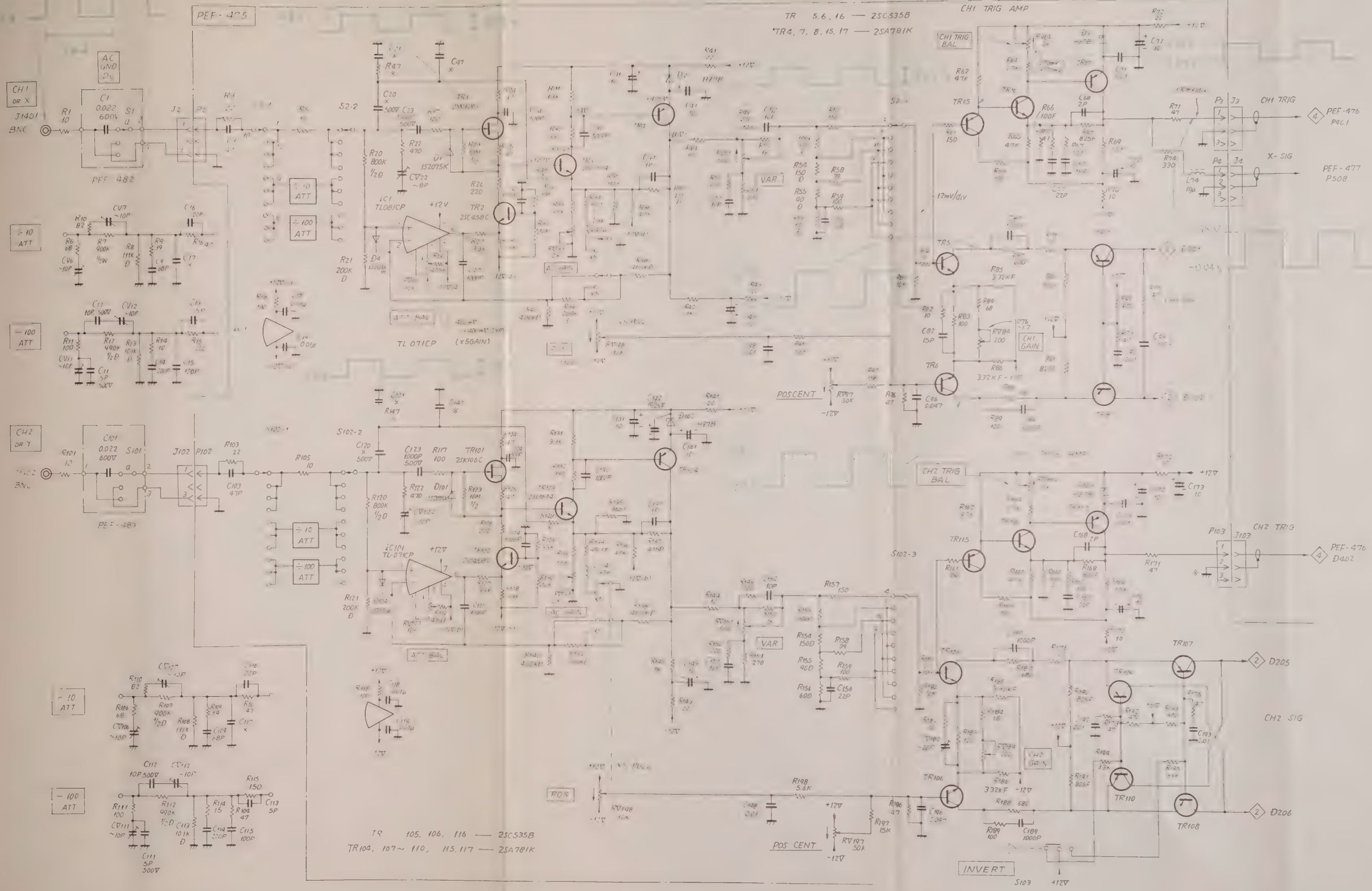



V550 PB-3
P* 114447


PEF-479B
PEF-478
PEF-486
PEF-485
PEF-484b
PEF-480B
PEF-481
HIGH VOLT DANGER
CRT BIAS
EXT. BLK
FOCUS
ILLUM
CRT
R.COIL
CAL
TEST
AST'G
GEOM
+12V
+5V
+100V
-12V
0.5V
1KHZ

## 7. DIAGRAM

※ Refer to ELECTRIC PARTS LIST, when this simbol is remarked






VERTICAL PREAMPLIFIER

D201 ~ 217 1S2075K

CH1 SIG ① TR

CH2 SIG ① TR

TR

CH3 SIG

PEF 476 P325

J203 P203

CH3 CENT

MODE

CHOP CONT PEF-477 P510

CH SW PULSE

TRIG

S201

IC 201 74LS 109A

IC 202 74LS09

TR201 2SC1906

TR202 2SC535B

TR203 2SA781K

TR204 2SA781K

TR206 2SC1906

PEF-485

DL 1401

PEF-478

P204 J204

P202 J202

PEF 474 P1102

PEF-475

A EXT INPUT: 0.5V 1KHz

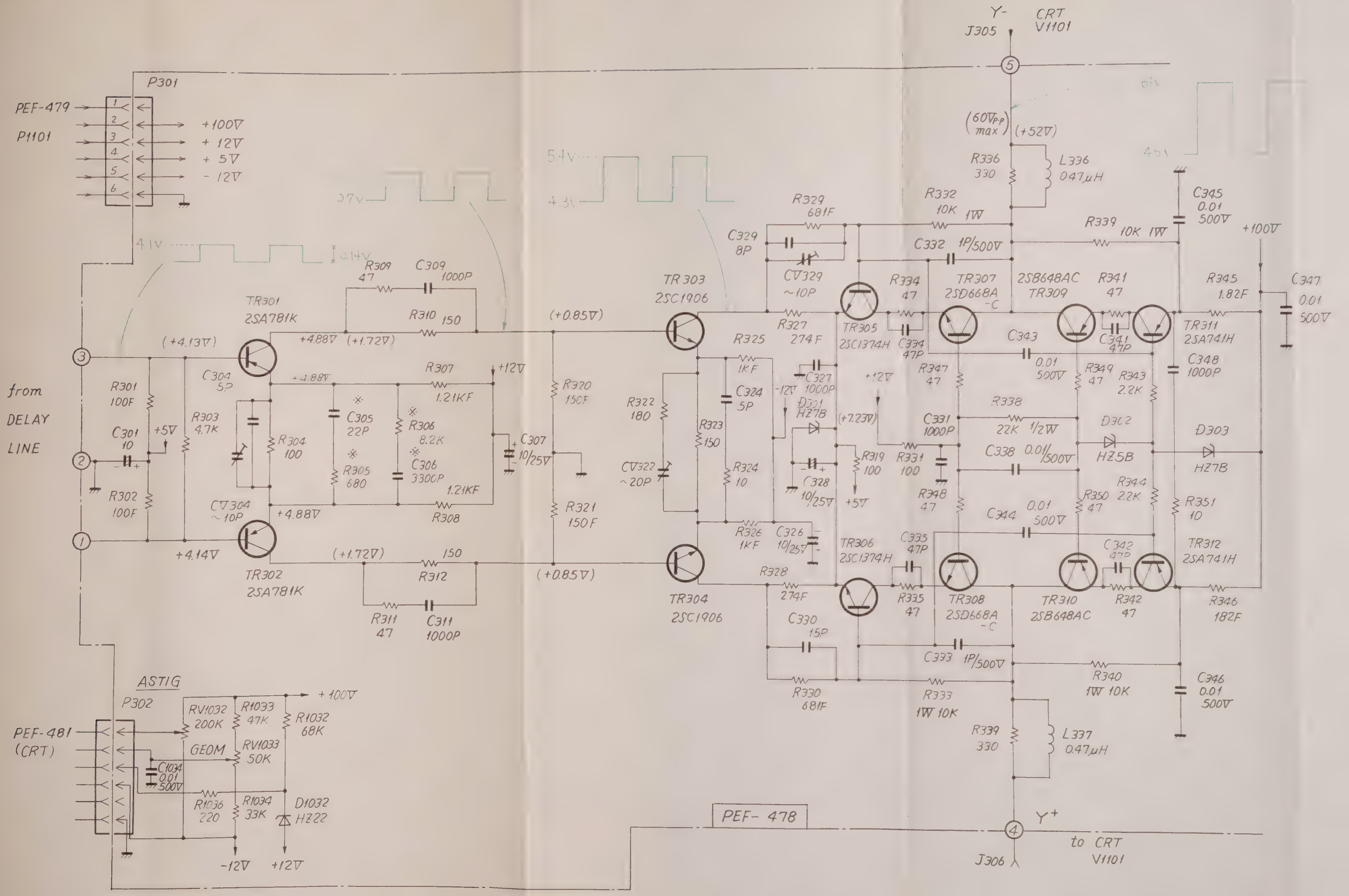
A TRIG SOURCE: EXT

V. MODE: CHOP

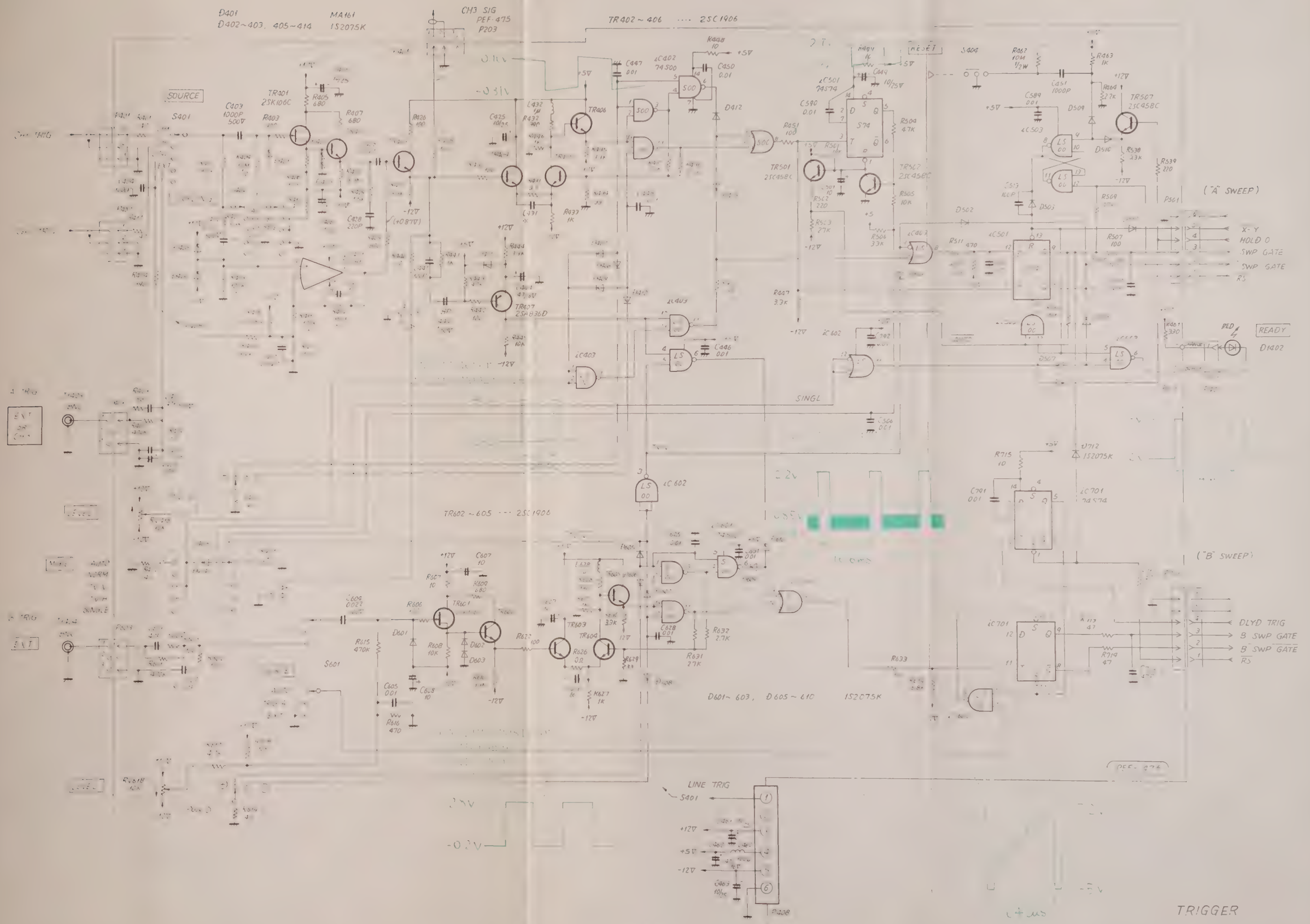
* OPEN COLLECTOR



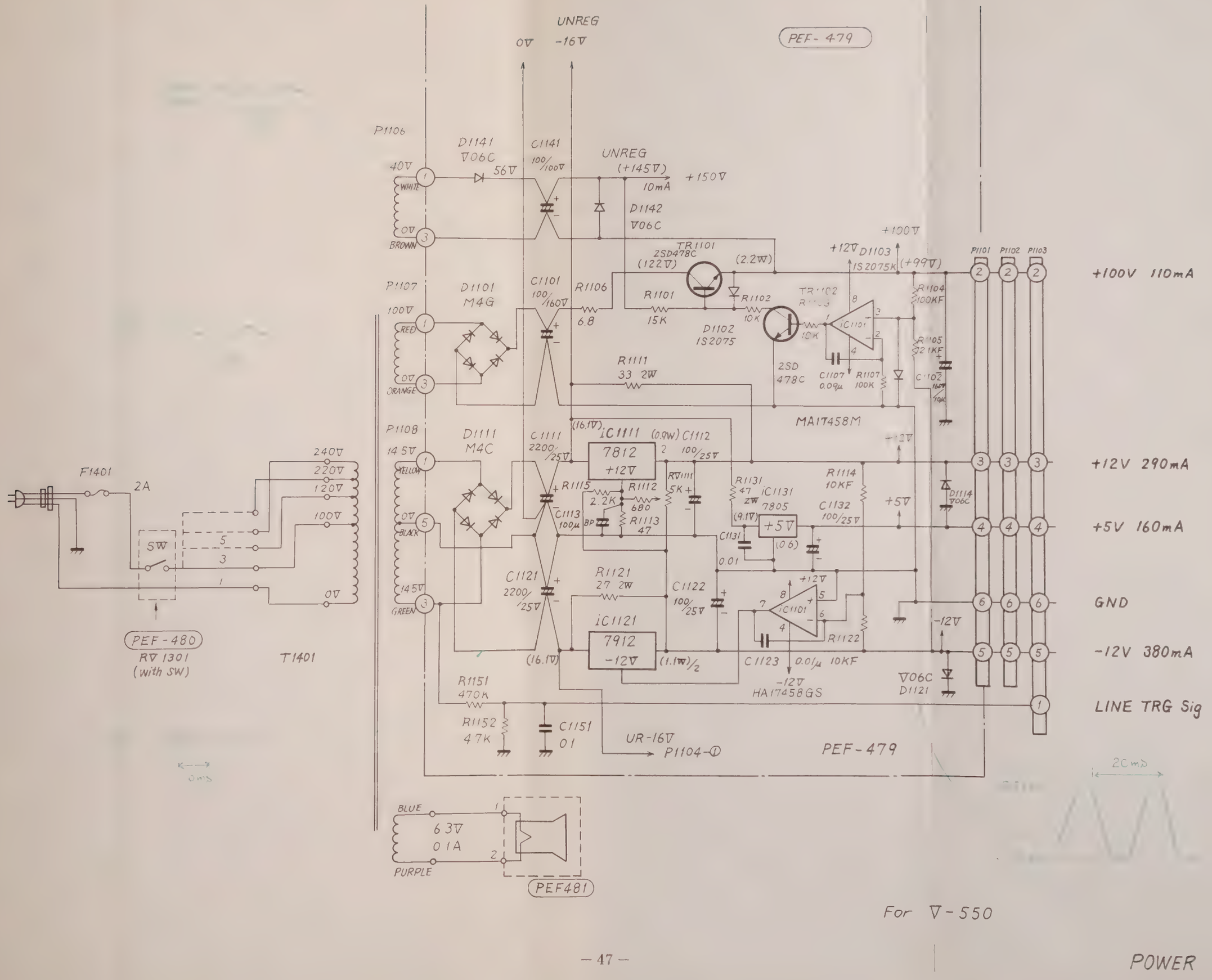
VERTICAL CHANNEL SWITCH



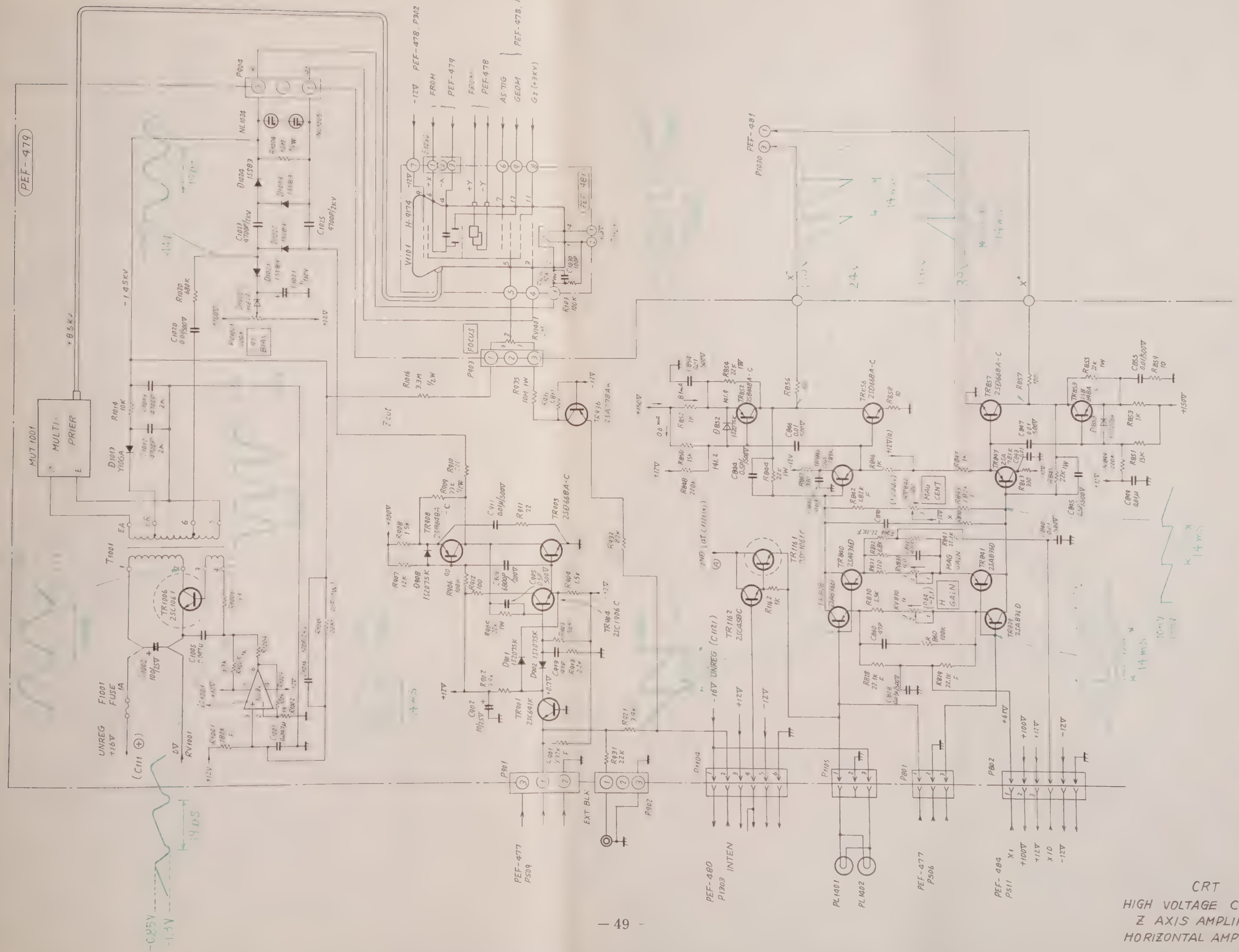

VERTICAL OUTPUT AMPLIFIER

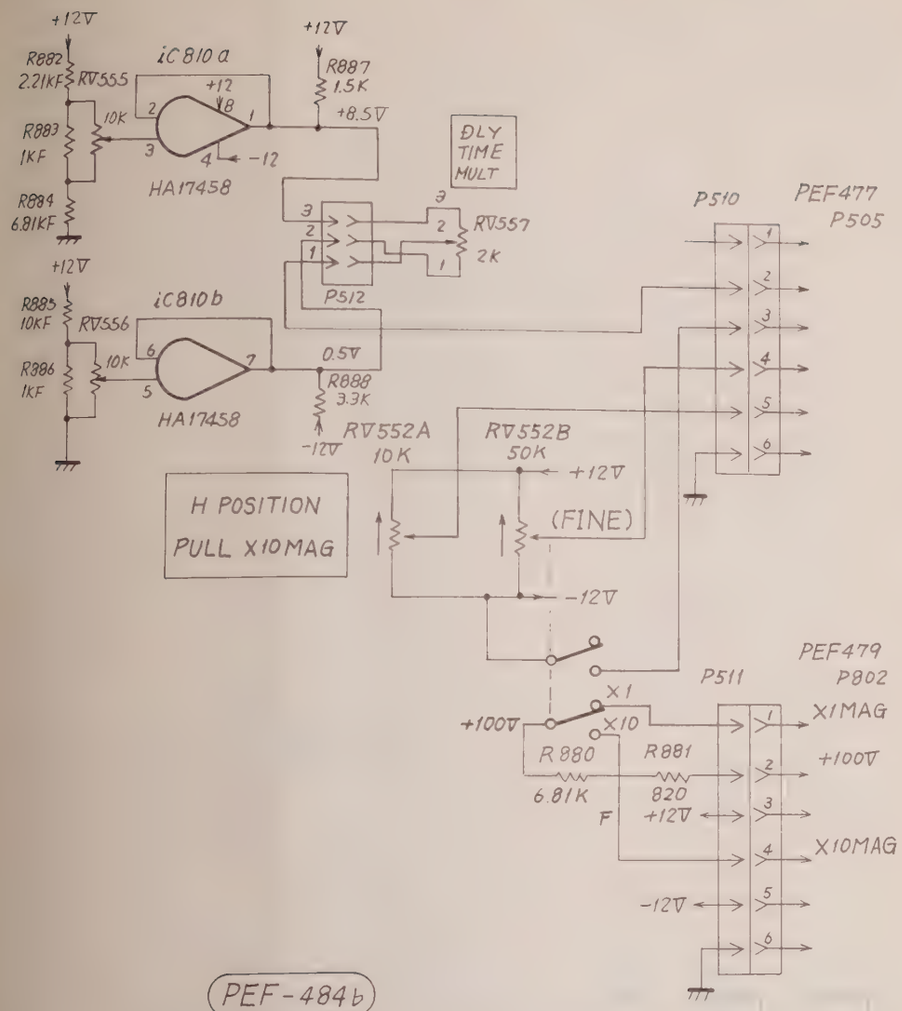

D401
D402~403, 405~414
MA161
1S2075K
CH3 SIG
PEF-475
P203
TR402~406 ···· 2SC1906
SOURCE
S401
TR401
2SK106C
TR406
TR407
2SA836D
TR501
2SC458C
TR502
2SC458C
TR507
2SC458C
IC402
74S00
IC501
74S74
IC503
IC602
IC603
IC701
74S74
RESET
SINGL
("A" SWEEP)
X-Y
HOLD O
SWP GATE
SWP GATE
RS
READY
D1402
("B" SWEEP)
DLYD TRIG
B SWP GATE
B SWP GATE
RS
TRIGGER
TR602~605 ··· 2SC1906
D601~603, D605~610
1S2075K
S601
LINE TRIG
S401
P438
+12V
+5V
-12V

# SWEEP GENERATOR


PEF-479
UNREG
0V
-16V
P1106
D1141
V06C
C1141
100/100V
UNREG
(+145V)
+150V
10mA
D1142
V06C
WHITE
BROWN
40V
56V
TR1101
2SD478C
(122V)
(2.2W)
+12V
D1103
1S2075K
(+99V)
+100V
P1101
P1102
P1103
+100V 110mA
P1107
100V
RED
ORANGE
D1101
M4G
C1101
100/160V
R1106
6.8
R1101
15K
R1102
10K
D1102
1S2075
TR1102
R1103
IC1101
R1104
100KF
R1105
2.1KF
C1102
160V
10μ
R1111
33 2W
2SD
478C
C1107
0.09μ
R1107
100K
MA17458M
P1108
14.5V
YELLOW
BLACK
14.5V
GREEN
D1111
M4C
C1111
2200/25V
(16.1V)
IC1111
7812
+12V
(0.9W)
C1112
100/25V
R1115
2.2K
R1112
680
BP
C1113
100μ
R1113
47
RV1111
5K
R1131
47
2W
IC1131
7805
+5V
(9.1V)
(0.6)
C1131
0.01
C1132
100/25V
R1114
10KF
+5V
+12V
-12V
D1114
V06C
C1121
2200/25V
R1121
27 2W
C1122
100/25V
IC1121
7912
-12V
(16.1V)
(1.1W)/2
R1122
C1123
0.01μ 10KF
-12V
HA17458GS
V06C
D1121
R1151
470K
R1152
47K
C1151
01
UR-16V
P1104-①
PEF-479
+12V 290mA
+5V 160mA
GND
-12V 380mA
LINE TRG Sig
20mS
0mS
F1401
2A
240V
220V
120V
100V
0V
SW
5
3
1
PEF-480
RV 1301
(with SW)
T1401
BLUE
PURPLE
6.3V
0.1A
PEF481

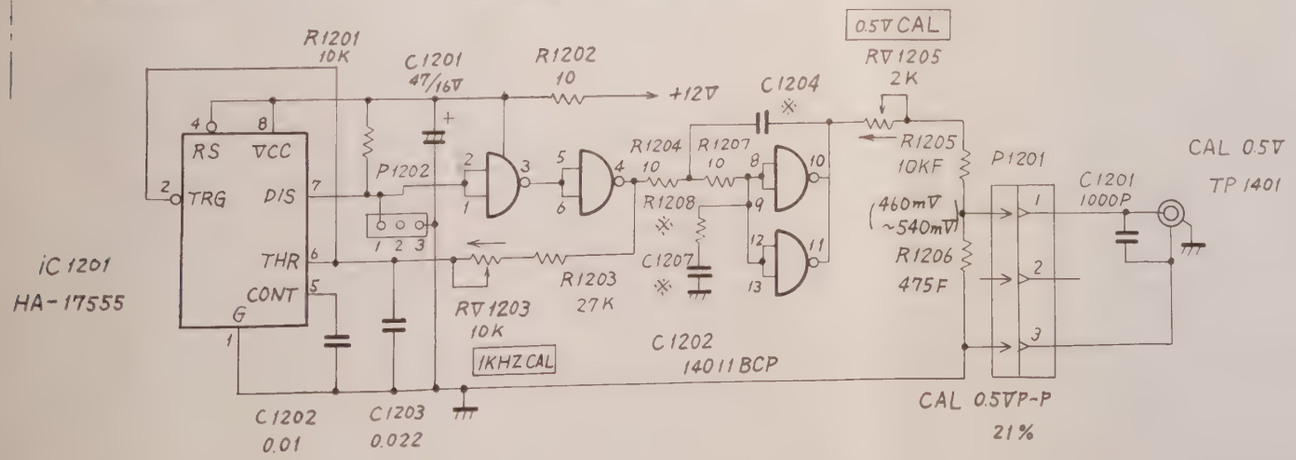
For V-550


PEF-479
+85KV
-145KV
MULTI-PRIER
MUT 1001
T1001
F1001 FUSE 1A
UNREG +16V
RV1001
-12V
+12V
FOCUS
P903
P901
P902
EXT BLK
PEF-477 P509
PEF-480 P1303 INTEN
PEF-477 P506
PEF-484 P511
PL1401
PL1402
P1030
PEF-481
P1104
P1105
P801
P802
-12V FROM PEF-479
PEF-478
AS TIG
GEOM
G2 (+3KV)
PEF-478, P302
PEF-478. P302
PEF-481
H-GAIN
V-GAIN
CRT
HIGH VOLTAGE CIRCUIT
Z AXIS AMPLIFIER
HORIZONTAL AMPLIFIER

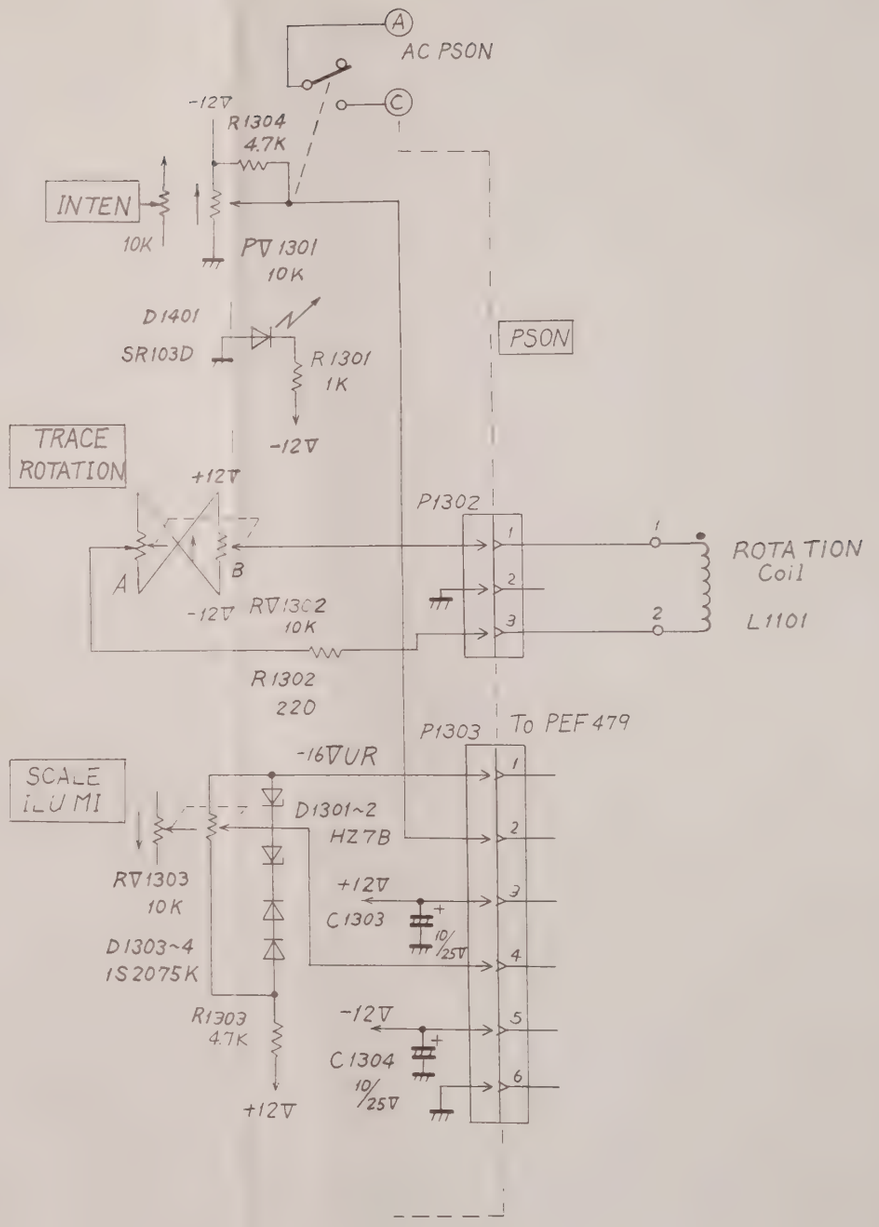



PEF-484b

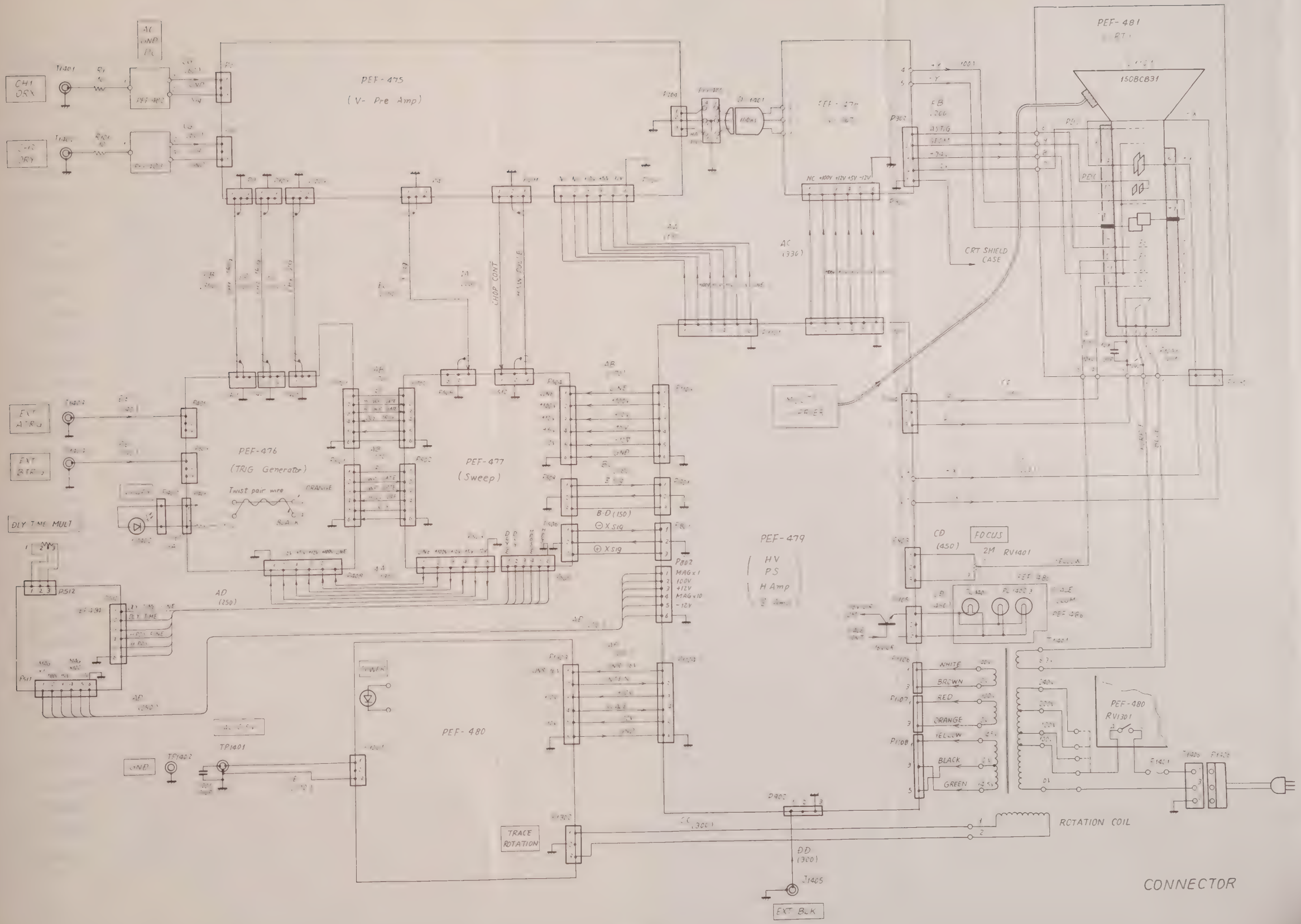
PEF-480




CALIBRATOR




INTENSITY
TRACE ROTATION
SCALE ILUMINATION


PEF-475
(V- Pre Amp)
PEF-476
(TRIG Generator)
PEF-477
(Sweep)
PEF-479
HV
PS
H Amp
PEF-480
PEF-481
CH1 ORY
CH2 ORY
EXT TRIG
DLY TIME MULT
CHOP CONT
MAIN PULSE
CRT SHIELD CASE
15DBCB31
FOCUS
2M RV1401
RV1301
TRACE ROTATION
ROTATION COIL
EXT BLK
WHITE
BROWN
RED
ORANGE
YELLOW
BLACK
GREEN
Twist pair wire
ORANGE
B-D (150)
⊖ X SIG
⊕ X SIG
MAG x1
100V
+12V
MAG x10
-12V
TP1401
TP1402
GND
AC (330)
CD (450)
DD (300)
CC (300)
AD (250)

CONNECTOR

# ELECTRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-475)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C3 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C9 | C,CERAMIC 50 V 68 PF+-5% | CCC1034 | 1 |
| C11 | C,CERAMIC 500 V 5 PF+-0.5PF | CCC0769 | 1 |
| C12 | C,CERAMIC 500 V 10 PF+-10% | CCC0772 | 1 |
| C13 | C,CERAMIC 50 V 5 PF+-0.25PF | CCC0999 | 1 |
| C14 | C,CERAMIC 50 V 220 PF+-10% | CCC1027 | 1 |
| C15 | C,CERAMIC 50 V 100 PF+-10% | CCC1025 | 1 |
| C18 | C,CERAMIC 50 V 10000 PF+80%-20 | CCC1030 | 1 |
| C19 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C16 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C23 | C,CERAMIC 500 V 1000 PF+-10% | CCD0217 | 1 |
| C24 | C,CERAMIC 50 V 100 PF+-10% | CCC1025 | 1 |
| C27 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| C29 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C31 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C32 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C37 | C,CERAMIC 50 V 1 PF+-0.25PF | CCC1133 | 1 |
| C41 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C43 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C51 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C52 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C56 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C67 | C,CERAMIC 50 V 15 PF+-5% | CCC1004 | 1 |
| C68 | C,CERAMIC 50 V 2 PF+-0.25PF | CCC0996 | 1 |
| C70 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C71 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C72 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C77 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C82 | C,CERAMIC 50 V 15 PF+-5% | CCC1004 | 1 |
| C87 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C89 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| C92 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C93 | C,CERAMIC 50 V 3 PF+-0.25PF | CCC0997 | 1 |
| C96 | C,PLASTIC 50 V 0.047 UF | CQA0101 | 1 |
| C98 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| CV6 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV7 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV11 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV12 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV22 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| D1 | DIODE 1S2075K | HDS0108 | 1 |
| D2 | DIODE HZ7B | HDH0040 | 1 |
| D3 | DIODE HZ7B | HDH0040 | 1 |
| D4 | DIODE 1S2075K | HDS0108 | 1 |
| IC1 | IC,ANALOG TL071CP | ILT0041 | 1 |
| TR1 | TRANSISTOR 2SK106C | HTK0068 | 1 |
| TR2 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR3 | TRANSISTOR 2SC1674K | HTC0557 | 1 |
| TR4 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR5 | TRANSISTOR 2SC535B | HTC0167 | 1 |
| TR6 | TRANSISTOR 2SC535B | HTC0167 | 1 |
| TR7 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR8 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR15 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR16 | TRANSISTOR 2SC535B | HTC0167 | 1 |
| TR17 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| R3 | R,CARBON 1/4W 22 OHM +-5% | RCR3012 | 1 |
| R4 | R,CARBON 1/4W 15 OHM +-5% | RCR3008 | 1 |
| R5 | R,CARBON 1/4W 10 OHM +-5% | RCR3004 | 1 |
| R6 | R,CARBON 1/4W 68 OHM +-5% | RCR3024 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R7 | R,METAL | 1/2W | 900 | KOHM +-0.5% | RMR0261 | 1 |
| R8 | R,METAL | 1/4W | 111 | KOHM +-0.5% | RME0694 | 1 |
| R9 | R,CARBON | 1/4W | 39 | OHM +-5% | RCR3018 | 1 |
| R10 | R,CARBON | 1/4W | 82 | OHM +-5% | RCR3026 | 1 |
| R11 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R12 | R,METAL | 1/2W | 990 | KOHM +-0.5% | RMR0264 | 1 |
| R13 | R,METAL | 1/4W | 10.1 | KOHM +-0.5% | RME0695 | 1 |
| R14 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R15 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R16 | R,CARBON | 1/4W | 47 | OHM + 5% | RCR3020 | 1 |
| R17 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R18 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R19 | R,METAL | 1/4W | 4.75 | KOHM +-1% | RME0672 | 1 |
| R20 | R,METAL | 1/2W | 800 | KOHM +-0.5% | RMR0259 | 1 |
| R21 | R,METAL | 1/4W | 200 | KOHM +-0.5% | RME0702 | 1 |
| R22 | R,CARBON | 1/4W | 470 | OHM +-5% | RCR3044 | 1 |
| R23 | R,SOLID | 1/2W | 10 | MOHM +-5% | RSE0311 | 1 |
| R24 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R25 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R26 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R27 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R28 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R29 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R30 | R,CARBON | 1/4W | 10 | KOHM +-5% | RCR3076 | 1 |
| R31 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R32 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R33 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R34 | R,METAL | 1/4W | 45.3 | OHM +-0.5% | RME0766 | 1 |
| R35 | R,METAL | 1/4W | 365 | OHM +-1% | RME0705 | 1 |
| R36 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R37 | R,METAL | 1/4W | 475 | OHM +-0.5% | RME0703 | 1 |
| R38 | R,METAL | 1/4W | 46.0 | KOHM +-0.5% | RME0706 | 1 |
| R39 | R,METAL | 1/4W | 200 | KOHM +-0.5% | RME0702 | 1 |
| R40 | R,METAL | 1/4W | 4.00 | KOHM +-0.5% | RME0707 | 1 |
| R41 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R42 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R43 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R44 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R47 | R,CARBON | 1/4W | 100 | KOHM +-5% | RCR3100 | 1 |
| R49 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R50 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R51 | R,CARBON | 1/4W | 270 | OHM +-5% | RCR3038 | 1 |
| R52 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R53 | R,METAL | 1/4W | 300 | OHM +-0.5% | RME0708 | 1 |
| R54 | R,METAL | 1/4W | 150 | OHM +-0.5% | RME0709 | 1 |
| R55 | R,METAL | 1/4W | 90.0 | OHM +-0.5% | RME0710 | 1 |
| R56 | R,METAL | 1/4W | 60.0 | OHM +-0.5% | RME0711 | 1 |
| R57 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R58 | R,CARBON | 1/4W | 39 | OHM +-5% | RCR3018 | 1 |
| R59 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R61 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R62 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R63 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R64 | R,CARBON | 1/4W | 2.7 | KOHM +-5% | RCR3062 | 1 |
| R65 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R66 | R,METAL | 1/4W | 100 | OHM +-1% | RME0652 | 1 |
| R67 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R68 | R,METAL | 1/4W | 825 | OHM +-1% | RME0663 | 1 |
| R69 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R70 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R71 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R72 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R73 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R74 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R75 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R76 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R77 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R80 | R,CARBON | 1/4W | 10 | KOHM +-5% | RCR3076 | 1 |
| R81 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R82 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R83 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R84 | R,CARBON | 1/4W | 68 | OHM +-5% | RCR3024 | 1 |
| R85 | R,METAL | 1/4W | 3.32 | KOHM +-1% | RME0670 | 1 |
| R86 | R,METAL | 1/4W | 3.32 | KOHM +-1% | RME0670 | 1 |
| R87 | R,CARBON | 1/4W | 680 | OHM +-5% | RCR3048 | 1 |
| R88 | R,CARBON | 1/4W | 680 | OHM +-5% | RCR3048 | 1 |
| R89 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R90 | R,METAL | 1/4W | 825 | OHM +-1% | RME0663 | 1 |
| R91 | R,METAL | 1/4W | 825 | OHM +-1% | RME0663 | 1 |
| R92 | R,CARBON | 1/4W | 470 | OHM +-5% | RCR3044 | 1 |
| R96 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R97 | R,CARBON | 1/4W | 15 | KOHM +-5% | RCR3080 | 1 |
| R98 | R,CARBON | 1/4W | 5.6 | KOHM +-5% | RCR3070 | 1 |
| RV27 | VR,METAL | TM8KH1-7E1 | | 10K OHM | RNT0181 | 1 |
| RV33 | VR,METAL | TM8KH1-7E1 | | 2K OHM | RNT0182 | 1 |
| RV51 | SW,ROTARY | S21P 3310 (WITH VR) | | | HX3142079 | R |
| RV64 | VR,METAL | TM8KH1-7E1 | | 2K OHM | RNT0182 | 1 |
| RV84 | VR,METAL | TM8KH1-7E1 | | 200 OHM | RNT0183 | 1 |
| RV97 | VR,METAL | TM8KH1-7E1 | | 50K OHM | RNT0184 | 1 |
| RV98 | VR,CARBON | EVH-YK3325B14 | | | RDE0003 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| L34 | COIL FL-3H R47M | TLF0052 | 1 |
| L74 | COIL FL-3H 100K | TLF0028 | 1 |
| P2 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P3 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P4 | CONNECTOR 171825-3 | JBX0468 | 1 |
| S2 | SW,ROTARY S21P 3310 (WITH VR) | HX3142079 | 1 |
| C103 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C109 | C,CERAMIC 50 V 68 PF+-5% | CCC1034 | 1 |
| C111 | C,CERAMIC 500 V 5 PF+-0.5PF | CCC0769 | 1 |
| C112 | C,CERAMIC 500 V 10 PF+-10% | CCC0772 | 1 |
| C113 | C,CERAMIC 50 V 5 PF+-0.25PF | CCC0999 | 1 |
| C114 | C,CERAMIC 50 V 220 PF+-10% | CCC1027 | 1 |
| C115 | C,CERAMIC 50 V 100 PF+-10% | CCC1025 | 1 |
| C118 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C119 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C116 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C123 | C,CERAMIC 500 V 1000 PF+-10% | CCD0217 | 1 |
| C124 | C,CERAMIC 50 V 100 PF+-10% | CCC1025 | 1 |
| C127 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| C129 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C131 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C132 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C137 | C,CERAMIC 50 V 1 PF+-0.25PF | CCC1133 | 1 |
| C141 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C142 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C143 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C151 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C152 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C156 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C167 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C168 | C,CERAMIC 50 V 2 PF+-0.25PF | CCC0996 | 1 |
| C170 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C171 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C172 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C173 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C187 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| C189 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| C192 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C193 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C196 | C,PLASTIC 50 V 47000 PF+-10% | CQA0101 | 1 |
| C198 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| CV106 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV107 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV111 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV112 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV122 | C,VALIABLE ECV-1ZW10 ×40 | CVE0024 | 1 |
| CV182 | C,VARIABLE ECV-1ZW20 ×40 | CVE0019 | 1 |
| D101 | DIODE 1S2075K | HDS0108 | 1 |
| D102 | DIODE HZ7B | HDH0040 | 1 |
| D103 | DIODE HZ7B | HDH0040 | 1 |
| D104 | DIODE 1S2075K | HDS0108 | 1 |
| IC101 | IC,ANALOG TL071CP | ILT0041 | 1 |
| TR101 | TRANSISTOR 2SK106C | HTK0068 | 1 |
| TR102 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR103 | TRANSISTOR 2SC1674K | HTC0557 | 1 |
| TR104 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR105 | TRANSISTOR 2SC535B | HTC0167 | 1 |
| TR106 | TRANSISTOR 2SC535B | HTC0167 | 1 |
| TR107 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR108 | TRANSISTOR 2SA781K | HTA0099 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| TR109 | TRANSISTOR | 2SA781K | | | HTA0099 | 1 |
| TR110 | TRANSISTOR | 2SA781K | | | HTA0099 | 1 |
| TR115 | TRANSISTOR | 2SA781K | | | HTA0099 | 1 |
| TR116 | TRANSISTOR | 2SC535B | | | HTC0167 | 1 |
| TR117 | TRANSISTOR | 2SA781K | | | HTA0099 | 1 |
| R103 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R104 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R105 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R106 | R,CARBON | 1/4W | 68 | OHM +-5% | RCR3024 | 1 |
| R107 | R,METAL | 1/2W | 900 | KOHM +-0.5% | RMR0261 | 1 |
| R108 | R,METAL | 1/4W | 111 | KOHM +-0.5% | RME0694 | 1 |
| R109 | R,CARBON | 1/4W | 39 | OHM +-5% | RCR3018 | 1 |
| R110 | R,CARBON | 1/4W | 82 | OHM +-5% | RCR3026 | 1 |
| R111 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R112 | R,METAL | 1/2W | 990 | KOHM +-0.5% | RMR0264 | 1 |
| R113 | R,METAL | 1/4W | 10.1 | KOHM +-0.5% | RME0695 | 1 |
| R114 | R,CARBON | 1/4W | 15 | OHM +-5% | RCR3008 | 1 |
| R115 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R116 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R117 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R118 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R119 | R,METAL | 1/4W | 4.75 | KOHM +-1% | RME0672 | 1 |
| R120 | R,METAL | 1/2W | 800 | KOHM +-0.5% | RMR0259 | 1 |
| R121 | R,METAL | 1/4W | 200 | KOHM +-0.5% | RME0702 | 1 |
| R122 | R,CARBON | 1/4W | 470 | OHM +-5% | RCR3044 | 1 |
| R123 | R,SOLID | 1/2W | 10 | MOHM +-5% | RSE0311 | 1 |
| R124 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R125 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R126 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R127 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R128 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R129 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R130 | R,CARBON | 1/4W | 10 | KOHM +-5% | RCR3076 | 1 |
| R131 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R132 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R133 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R134 | R,METAL | 1/4W | 45.3 | OHM +-0.5% | RME0766 | 1 |
| R135 | R,METAL | 1/4W | 365 | OHM +-1% | RME0705 | 1 |
| R136 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R137 | R,METAL | 1/4W | 475 | OHM +-0.5% | RME0703 | 1 |
| R138 | R,METAL | 1/4W | 46.0 | KOHM +-0.5% | RME0706 | 1 |
| R139 | R,METAL | 1/4W | 200 | KOHM +-0.5% | RME0702 | 1 |
| R140 | R,METAL | 1/4W | 4.00 | KOHM +-0.5% | RME0707 | 1 |
| R141 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R142 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R143 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R144 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R147 | R,CARBON | 1/4W | 100 | KOHM +-5% | RCR3100 | 1 |
| R149 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R150 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| R151 | R,CARBON | 1/4W | 270 | OHM +-5% | RCR3038 | 1 |
| R152 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R153 | R,METAL | 1/4W | 300 | OHM +-0.5% | RME0708 | 1 |
| R154 | R,METAL | 1/4W | 150 | OHM +-0.5% | RME0709 | 1 |
| R155 | R,METAL | 1/4W | 90.0 | OHM +-0.5% | RME0710 | 1 |
| R156 | R,METAL | 1/4W | 60.0 | OHM +-0.5% | RME0711 | 1 |
| R157 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R158 | R,CARBON | 1/4W | 39 | OHM +-5% | RCR3018 | 1 |
| R159 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R161 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R162 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R163 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R164 | R,CARBON | 1/4W | 2.7 | KOHM +-5% | RCR3062 | 1 |
| R165 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R166 | R,METAL | 1/4W | 100 | OHM +-1% | RME0652 | 1 |
| R167 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R168 | R,METAL | 1/4W | 825 | OHM +-1% | RME0663 | 1 |
| R169 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R170 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R171 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R172 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R173 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R175 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R176 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R180 | R,CARBON | 1/4W | 10 | KOHM +-5% | RCR3076 | 1 |
| R181 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R182 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R183 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R184 | R,CARBON | 1/4W | 68 | OHM +-5% | RCR3024 | 1 |
| R185 | R,METAL | 1/4W | 3.32 | KOHM +-1% | RME0670 | 1 |
| R186 | R,METAL | 1/4W | 3.32 | KOHM +-1% | RME0670 | 1 |
| R187 | R,CARBON | 1/4W | 680 | OHM +-5% | RCR3048 | 1 |
| R188 | R,CARBON | 1/4W | 680 | OHM +-5% | RCR3048 | 1 |
| R189 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R190 | R,METAL | 1/4W | 825 | OHM +-1% | RME0663 | 1 |
| R191 | R,METAL | 1/4W | 825 | OHM +-1% | RME0663 | 1 |
| R192 | R,CARBON | 1/4W | 470 | OHM +-5% | RCR3044 | 1 |
| R193 | R,CARBON | 1/4W | 470 | OHM +-5% | RCR3044 | 1 |
| R194 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R195 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R196 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R197 | R,CARBON 1/4W 15 KOHM +-5% | RCR3080 | 1 |
| R198 | R,CARBON 1/4W 5.6 KOHM +-5% | RCR3070 | 1 |
| RV127 | VR,METAL TM8KH1-7E1 10K OHM | RNT0181 | 1 |
| RV133 | VR,METAL TM10K(PV)1SB 2K OHM | RNT0033 | 1 |
| RV151 | SW,ROTARY S21P 3310 (WITH VR) | HX3142079 | R |
| RV164 | VR,METAL TM8KH1-7E1 2K OHM | RNT0182 | 1 |
| RV184 | VR,METAL TM8KH1-7E1 200 OHM | RNT0183 | 1 |
| RV197 | VR,METAL TM8KH1-7E1 50K OHM | TNT0184 | 1 |
| RV198 | VR,CARBON EVH-YK3325B14 | RDE0003 | 1 |
| L134 | COIL FL-3H R47M | TLF0052 | 1 |
| P102 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P103 | CONNECTOR 171825-3 | JBX0468 | 1 |
| S102 | SW,ROTARY S21P 3310 (WITH VR) | HX3142079 | 1 |
| S103 | SW,PB UEG22-2 (LOCK) | HX8311793-C | 1 |
|  | CONNECTOR 163740-1 | JBX0557 | 1 |
| C204 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C206 | C,CERAMIC 50 V 2 PF+-0.25PF | CCC0996 | 1 |
| C211 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C216 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C221 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C223 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C224 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C225 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C233 | C,AL ELYC 50 V 1 UF | CET0031 | 1 |
| C234 | C,CERAMIC 50 V 15 PF+-5 | CCC1004 | 1 |
| C237 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C235 | C,CERAMIC 50 V 22 PF+-5 | CCC1007 | 1 |
| C241 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C244 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |

| Symbol | Description | | | | | Code | Qty |
|---|---|---|---|---|---|---|---|
| D201 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D202 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D203 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D204 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D205 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D206 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D207 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D208 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D209 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D210 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D211 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D212 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D213 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D214 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D215 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D216 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| D217 | DIODE | 1S2075 K | | | | HDS0108 | 1 |
| IC201 | IC,DIGITAL | HD74LS109AP | | | | IDH0713 | 1 |
| IC202 | IC,DIGITAL | HD74LS09P | | | | IDH0680 | 1 |
| R201 | R,CARBON | 1/4W | 3.3 | KOHM | +-5% | RCR3064 | 1 |
| R202 | R,CARBON | 1/4W | 100 | OHM | +-5% | RCR3028 | 1 |
| R203 | R,CARBON | 1/4W | 10 | OHM | +-5% | RCR3004 | 1 |
| R204 | R,CARBON | 1/4W | 8.2 | KOHM | +-5% | RCR3074 | 1 |
| R205 | R,CARBON | 1/4W | 100 | OHM | +-5% | RCR3028 | 1 |
| R206 | R,CARBON | 1/4W | 1.0 | KOHM | +-5% | RCR3052 | 1 |
| R207 | R,METAL | 1/4W | 619 | OHM | +-1% | RME0693 | 1 |
| R209 | R,METAL | 1/4W | 3.32 | KOHM | +-1% | RME0670 | 1 |
| R210 | R,METAL | 1/4W | 3.32 | KOHM | +-1% | RME0670 | 1 |
| R211 | R,CARBON | 1/4W | 680 | OHM | +-5% | RCR3048 | 1 |
| R212 | R,CARBON | 1/4W | 10 | OHM | +-5% | RCR3004 | 1 |

| Symbol | Description | | | | | Code | Qty |
|---|---|---|---|---|---|---|---|
| R213 | R,METAL | 1/4W | 825 | OHM | +-1% | RME0663 | 1 |
| R214 | R,METAL | 1/4W | 825 | OHM | +-1% | RME0663 | 1 |
| R215 | R,CARBON | 1/4W | 470 | OHM | +-5% | RCR3044 | 1 |
| R221 | R,METAL | 1/4W | 3.32 | KOHM | +-1% | RME0670 | 1 |
| R222 | R,METAL | 1/4W | 3.32 | KOHM | +-1% | RME0670 | 1 |
| R223 | R,METAL | 1/4W | 1.82 | KOHM | +-1% | RME0667 | 1 |
| R224 | R,METAL | 1/4W | 1.82 | KOHM | +-1% | RME0667 | 1 |
| R225 | R,METAL | 1/4W | 1.21 | KOHM | +-1% | RME0665 | 1 |
| R226 | R,METAL | 1/4W | 1.21 | KOHM | +-1% | RME0665 | 1 |
| R227 | R,METAL | 1/4W | 1.21 | KOHM | +-1% | RME0665 | 1 |
| R229 | R,METAL | 1/4W | 182 | OHM | +-1% | RME0655 | 1 |
| R230 | R,METAL | 1/4W | 182 | OHM | +-1% | RME0655 | 1 |
| R231 | R,METAL | 1/4W | 221 | OHM | +-1% | RME0656 | 1 |
| R232 | R,METAL | 1/4W | 221 | OHM | +-1% | RME0656 | 1 |
| R233 | R,CARBON | 1/4W | 39 | KOHM | +-5% | RCR3090 | 1 |
| R234 | R,CARBON | 1/4W | 3.9 | KOHM | +-5% | RCR3066 | 1 |
| R235 | R,CARBON | 1/4W | 10 | KOHM | +-5% | RCR3076 | 1 |
| R237 | R,METAL | 1/4W | 909 | OHM | +-1% | RME0714 | 1 |
| R238 | R,METAL | 1/4W | 909 | OHM | +-1% | RME0714 | 1 |
| R239 | R,METAL | 1/4W | 86.6 | OHM | +-0.5% | RME0713 | 1 |
| R240 | R,METAL | 1/4W | 86.6 | OHM | +-0.5% | RME0713 | 1 |
| R241 | R,CARBON | 1/4W | 220 | OHM | +-5% | RCR3036 | 1 |
| R243 | R,CARBON | 1/4W | 100 | OHM | +-5% | RCR3028 | 1 |
| R244 | R,CARBON | 1/4W | 100 | OHM | +-5% | RCR3028 | 1 |
| R251 | R,CARBON | 1/4W | 10 | OHM | +-5% | RCR3004 | 1 |
| R252 | R,CARBON | 1/4W | 10 | OHM | +-5% | RCR3004 | 1 |
| R253 | R,CARBON | 1/4W | 10 | OHM | +-5% | RCR3004 | 1 |
| TR201 | TRANSISTOR | 2SC535B | | | | HTC0167 | 1 |
| TR202 | TRANSISTOR | 2SC535B | | | | HTC0167 | 1 |
| TR203 | TRANSISTOR | 2SA781K | | | | HTA0099 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| TR204 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR205 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR206 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| RV204 | VR,METAL TM10K(ṔV)1SB 10K OHM | RNT0031 | 1 |
| P201 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P202 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P203 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P204 | CONNECTOR 171825-3 | JBX0468 | 1 |
| S201 | SW,LEVER SLA225 | SSL0056 | 1 |
| S202 | SW,PB UEG22-2 (LOCK) | HX8311793-C | 1 |
| PEF-475 | PCB PB-2(PEF-475) | HX116441 | 1 |
| | | HX3142112 | R |
| PEF-487 | PCB PB-3(PEF-476,477,487) | HX116442 | R |

# ELECTRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-476)

| Symbol | Description | | | | | Code | Qty |
|---|---|---|---|---|---|---|---|
| C401 | C,CERAMIC | 500 | V | 22 | PF+-10% | CCC0776 | 1 |
| C402 | C,CERAMIC | 500 | V | 47 | PF+-5% | CCC0868 | 1 |
| C403 | C,CERAMIC | 500 | V | 1000 | PF+-10% | CCD0217 | 1 |
| C404 | C,CERAMIC | 50 | V | 1000 | PF+80%-20% | CCC1029 | 1 |
| C405 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C406 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C408 | C,PLASTIC | 50 | V | 47000 | PF+-10% | CQA0101 | 1 |
| C412 | C,PLASTIC | 600 | V | 22000 | PF+-10% | CQX0071 | 1 |
| C414 | C,CERAMIC | 50 | V | 1 | PF+-0.25PF | CCC1133 | 1 |
| C417 | C,PLASTIC | 50 | V | 47000 | PF+-10% | CQA0101 | 1 |
| C425 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C428 | C,CERAMIC | 50 | V | 220 | PF+-10% | CCC1027 | 1 |
| C441 | C,CERAMIC | 50 | V | 100 | PF+-10% | CCC1025 | 1 |
| C442 | C,AL ELYC | 50 | V | 1 | UF | CET0031 | 1 |
| C444 | C,AL ELYC | 16 | V | 47 | UF | CEC0170 | 1 |
| C446 | C,CERAMIC | 50 | V | 10000 | PF+80%-20% | CCC1030 | 1 |
| C447 | C,CERAMIC | 50 | V | 10000 | PF+80%-20% | CCC1030 | 1 |
| C448 | C,CERAMIC | 50 | V | 10000 | PF+80%-20% | CCC1030 | 1 |
| C449 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C450 | C,CERAMIC | 50 | V | 10000 | PF+80%-20% | CCC1030 | 1 |
| C451 | C,PLASTIC | 50 | V | 1000 | PF+-10% | CQA0091 | 1 |
| C461 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C462 | C,AL ELYC | 16 | V | 47 | UF | CEC0170 | 1 |
| C463 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C507 | C,CERAMIC | 50 | V | 47 | PF+-5% | CCC1014 | 1 |
| C501 | C,AL ELYC | 25 | V | 10 | UF | CEC0175 | 1 |
| C506 | C,CERAMIC | 50 | V | 10000 | PF+80%-20% | CCC1030 | 1 |
| C511 | C,PLASTIC | 50 | V | 0.1 | UF+-10% | CQA0103 | 1 |
| CV402 | C,VARIABLE | ECV-1ZW20 ×40 | | | | CVE0019 | 1 |
| C590 | C,CERAMIC | 50 | V | 10000 | PF+80%-20% | CCC1030 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C589 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| D401 | DIODE MA161 | HDM0051 | 1 |
| D402 | DIODE 1S2075K | HDS0108 | 1 |
| D403 | DIODE 1S2075K | HDS0108 | 1 |
| D405 | DIODE 1S2075K | HDS0108 | 1 |
| D406 | DIODE 1S2075K | HDS0108 | 1 |
| D407 | DIODE 1S2075K | HDS0108 | 1 |
| D408 | DIODE 1S2075K | HDS0108 | 1 |
| D409 | DIODE 1S2075K | HDS0108 | 1 |
| D410 | DIODE 1S2075K | HDS0108 | 1 |
| D411 | DIODE 1S2075K | HDS0108 | 1 |
| D412 | DIODE 1S2075K | HDS0108 | 1 |
| D413 | DIODE 1S2075K | HDS0108 | 1 |
| D414 | DIODE 1S2075K | HDS0108 | 1 |
| D712 | DIODE 1S2075K | HDS0108 | 1 |
| IC401 | IC,ANALOG TL081CP | ILT0037 | 1 |
| IG402 | IC,DIGITAL HD74S00 | IDH0402 | 1 |
| IC403 | IC,DIGITAL HD74LS00P | IDH0467 | 1 |
| IC501 | IC,DIGITAL HD74S74 | IDH0428 | 1 |
| IC503 | IC,DIGITAL HD74LS00P | IDH0467 | 1 |
| DI402 | DIODE SR103D | HDS0234 | 1 |
| R401 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R402 | R,CARBON 1/4W 470 KOHM +-5% | RCR3104 | 1 |
| R403 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R404 | R,SOLID 1/2W 10 MOHM +-5% | RSE0311 | 1 |
| R405 | R,CARBON 1/4W 680 OHM +-5% | RCR3048 | 1 |
| R406 | R,CARBON 1/4W 10 KOHM +-5% | RCR3076 | 1 |
| R407 | R,CARBON 1/4W 680 OHM +-5% | RCR3048 | 1 |
| R408 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| R409 | R,CARBON 1/4W 820 OHM +-5% | RCR3050 | 1 |
| R410 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R411 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R412 | R,METAL | 1/4W | 392 | KOHM +-1% | RME0722 | 1 |
| R413 | R,METAL | 1/4W | 100 | KOHM +-1% | RME0688 | 1 |
| R414 | R,METAL | 1/4W | 365 | KOHM +-1% | RME0697 | 1 |
| R415 | R,METAL | 1/4W | 100 | KOHM +-1% | RME0688 | 1 |
| R416 | R,METAL | 1/4W | 5.36 | KOHM +-1% | RME0698 | 1 |
| R417 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R418 | R,CARBON | 1/4W | 3.9 | KOHM +-5% | RCR3066 | 1 |
| R419 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R420 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R421 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R422 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R423 | R,CARBON | 1/4W | 68 | OHM +-5% | RCR3024 | 1 |
| R424 | R,CARBON | 1/4W | 390 | OHM +-5% | RCR3042 | 1 |
| R425 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R426 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R427 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R428 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R429 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R430 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R432 | R,CARBON | 1/4W | 390 | OHM +-5% | RCR3042 | 1 |
| R433 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R434 | R,CARBON | 1/4W | 33 | OHM +-5% | RCR3016 | 1 |
| R435 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R436 | R,CARBON | 1/4W | 2.7 | KOHM +-5% | RCR3062 | 1 |
| R437 | R,CARBON | 1/4W | 2.7 | KOHM +-5% | RCR3062 | 1 |
| R440 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R441 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R442 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R443 | R,CARBON | 1/4W | 47 | KOHM +-5% | RCR3092 | 1 |

| Symbol | Description | | | Code | Qty |
|---|---|---|---|---|---|
| R444 | R,CARBON | 1/4W | 3.3 KOHM +-5% | RCR3064 | 1 |
| R445 | R,CARBON | 1/4W | 10 KOHM +-5% | RCR3076 | 1 |
| R446 | R,CARBON | 1/4W | 1.0 KOHM +-5% | RCR3052 | 1 |
| R447 | R,CARBON | 1/4W | 3.3 KOHM +-5% | RCR3064 | 1 |
| R448 | R,CARBON | 1/4W | 10 OHM +-5% | RCR3004 | 1 |
| R449 | R,CARBON | 1/4W | 10 OHM +-5% | RCR3004 | 1 |
| R451 | R,CARBON | 1/4W | 100 OHM +-5% | RCR3028 | 1 |
| R452 | R,CARBON | 1/4W | 100 OHM +-5% | RCR3028 | 1 |
| R461 | R,CARBON | 1/4W | 330 OHM +-5% | RCR3040 | 1 |
| R462 | R,SOLID | 1/2W | 10 MOHM +-5% | RSE0311 | 1 |
| R463 | R,CARBON | 1/4W | 1.0 KOHM +-5% | RCR3052 | 1 |
| R501 | R,CARBON | 1/4W | 10 KOHM +-5% | RCR3076 | 1 |
| R502 | R,CARBON | 1/4W | 220 OHM +-5% | RCR3036 | 1 |
| R503 | R,CARBON | 1/4W | 2.7 KOHM +-5% | RCR3062 | 1 |
| R504 | R,CARBON | 1/4W | 4.7 KOHM +-5% | RCR3068 | 1 |
| R505 | R,CARBON | 1/4W | 10 KOHM +-5% | RCR3076 | 1 |
| R506 | R,CARBON | 1/4W | 3.3 KOHM +-5% | RCR3064 | 1 |
| R507 | R,CARBON | 1/4W | 100 OHM +-5% | RCR3028 | 1 |
| R508 | R,CARBON | 1/4W | 100 OHM +-5% | RCR3028 | 1 |
| R509 | R,CARBON | 1/4W | 4.7 KOHM +-5% | RCR3068 | 1 |
| R511 | R,CARBON | 1/4W | 470 OHM +-5% | RCR3044 | 1 |
| R512 | R,CARBON | 1/4W | 12 KOHM +-5% | RCR3078 | 1 |
| R510 | R,CARBON | 1/4W | 10 KOHM +-5% | RCR3076 | 1 |
| R538 | R,CARBON | 1/4W | 3.3 KOHM +-5% | RCR3064 | 1 |
| R539 | R,CARBON | 1/4W | 220 OHM +-5% | RCR3036 | 1 |
| RV418 | VR,CARBON | EVH-YK3325B14 | | RDE0003 | 1 |
| L462 | COIL | FL-5H 101K | | TLF0067 | 1 |
| L432 | COIL | FL-3H IROM | | TLF0054 | 1 |
| R464 | R,CARBON | 1/4W | 2.2 KOHM +-5% | RCR3060 | 1 |
| TR401 | TRANSISTOR | 2SK106C | | HTK0068 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| TR402 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR403 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR404 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR405 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR406 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR407 | TRANSISTOR 2SA836D | HTA0105 | 1 |
| TR501 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR502 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR507 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| P401 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P402 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P403 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P405 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P406 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P408 | CONNECTOR 171825-6 | JBX0470 | 1 |
| S401 | SW,LEVER SLA225 | SSL0056 | 1 |
| S402 | SW,LEVER SLA225 | SSL0056 | 1 |
| S403 | SW,LEVER SLA225 | SSL0056 | 1 |
| S404 | SW,PB UEG22-2 (NON-LOCK) | HX8311793-D | 1 |
| C601 | C,CERAMIC 500 V 47 PF+-5% | CCC0868 | 1 |
| C602 | C,CERAMIC 500 V 27 PF+-10% | CCC0777 | 1 |
| C604 | C,PLASTIC 600 V 22000 PF+-10% | CQX0071 | 1 |
| C605 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C607 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C608 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C625 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C627 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C628 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C631 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C713 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C791 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C792 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| D601 | DIODE 1S2075K | HDS0108 | 1 |
| D602 | DIODE 1S2075K | HDS0108 | 1 |
| D603 | DIODE 1S2075K | HDS0108 | 1 |
| D605 | DIODE 1S2075K | HDS0108 | 1 |
| D606 | DIODE 1S2075K | HDS0108 | 1 |
| D607 | DIODE 1S2075K | HDS0108 | 1 |
| D608 | DIODE 1S2075K | HDS0108 | 1 |
| D609 | DIODE 1S2075K | HDS0108 | 1 |
| D610 | DIODE 1S2075K | HDS0108 | 1 |
| D501 | DIODE 1S2075K | HDS0108 | 1 |
| D502 | DIODE 1S2075K | HDS0108 | 1 |
| D503 | DIODE 1S2075K | HDS0108 | 1 |
| D507 | DIODE 1S2075K | HDS0108 | 1 |
| D508 | DIODE 1S2075K | HDS0108 | 1 |
| D509 | DIODE 1S2075K | HDS0108 | 1 |
| D510 | DIODE 1S2075K | HDS0108 | 1 |
| D511 | DIODE 1S2075K | HDS0108 | 1 |
| D519 | DIODE 1S2075K | HDS0108 | 1 |
| TR601 | TRANSISTOR 2SK106C | HTK0068 | 1 |
| TR602 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR603 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR604 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR605 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| IC601 | IC,DIGITAL HD74S00 | IDH0402 | 1 |
| IC602 | IC,DIGITAL HD74LS00P | IDH0467 | 1 |
| IC701 | IC,DIGITAL HD74S74 | IDH0428 | 1 |
| R601 | R,CARBON 1/4W 470 KOHM +-5% | RCR3104 | 1 |
| R602 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R603 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R606 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R607 | R,CARBON 1/4W 10 OHM +-5% | RCR3004 | 1 |
| R608 | R,CARBON 1/4W 10 KOHM +-5% | RCR3076 | 1 |
| R609 | R,CARBON 1/4W 680 OHM +-5% | RCR3048 | 1 |
| R610 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| R615 | R,CARBON 1/4W 470 KOHM +-5% | RCR3104 | 1 |
| R616 | R,CARBON 1/4W 470 OHM +-5% | RCR3044 | 1 |
| R617 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| R618 | R,CARBON 1/4W 10 KOHM +-5% | RCR3076 | 1 |
| R619 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R621 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R622 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R627 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R628 | R,CARBON 1/4W 390 OHM +-5% | RCR3042 | 1 |
| R629 | R,CARBON 1/4W 33 OHM +-5% | RCR3016 | 1 |
| R630 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| R631 | R,CARBON 1/4W 2.7 KOHM +-5% | RCR3062 | 1 |
| R632 | R,CARBON 1/4W 2.7 KOHM +-5% | RCR3062 | 1 |
| R633 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R634 | R,CARBON 1/4W 6.8 KOHM +-5% | RCR3072 | 1 |
| R712 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R713 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R714 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R715 | R,CARBON 1/4W 10 OHM +-5% | RCR3004 | 1 |
| RV618 | VR,CARBON EVH-YK3325B14 | RDE0003 | 1 |
| L628 | COIL FL-3H 1ROM | TLF0054 | 1 |
| P603 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P701 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P501 | CONNECTOR 171825-6 | JBX0470 | 1 |

| Symbol | Description | | Code | Qty |
|---|---|---|---|---|
| S601 | SW,LEVER | SLA225 | SSL0056 | 1 |
| | WIRE | 1/0.4 × 2 (ORANGE & BLACK) | BBI0037 | 0.5meter |
| PEF-476 | PCB | PB-3 (PEF-476,477,487) | HX116442 | 1 |

# ELECTRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-477)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C514 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C516 | C,CERAMIC 50 V 220 PF+-10% | CCC1027 | 1 |
| C520 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C523 | C,PLASTIC 50 V 10000 PF+-10% | CQA0097 | 1 |
| C527 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C528 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C543 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C544 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C548 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C551 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C556 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C557 | C,CERAMIC 50 V 220 PF+-10% | CCC1027 | 1 |
| C558 | C,CERAMIC 50 V 680 PF+-10% | CCC1365 | 1 |
| C559 | C,CERAMIC 50 V 100 PF+-10% | CCC1025 | 1 |
| C560 | C,AL ELYC 16 V 47 UF | CEC0170 | 1 |
| C561 | C,PLASTIC 1MF+0.01MF 100V +-0.5% | HX3142077-A | 1 |
| C562 | C,PLASTIC 50 V 4700 PF+-10% | CQA0095 | 1 |
| C563 | C,PLASTIC 1MF+0.01MF 100V +-0.5% | HX3142077-A | R |
| C564 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C565 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C566 | C,AL ELYC 50 V 1 UF NP | CEC0391 | 1 |
| C567 | C,PLASTIC 50 V 0.1 UF+-10% | CQA0103 | 1 |
| C568 | C,PLASTIC 50 V 10000 PF+-10% | CQA0097 | 1 |
| C569 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| C570 | C,CERAMIC 50 V 100 PF+-10% | CCC1025 | 1 |
| C571 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C577 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C582 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C583 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C588 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C591 | C,CERAMIC 50 V 220 PF+-10% | CCC1027 | 1 |
| C592 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C593 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C596 | C,AL ELYC 160 V 1 UF | CEC0213 | 1 |
| C597 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C598 | C,AL ELYC 16 V 47 UF | CEC0170 | 1 |
| C599 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| CV514 | C,VARIABLE ECV-1ZW20 ×40 | CVE0019 | 1 |
| CV564 | C,VARIABLE ECV-1ZW20 ×40 | CVE0019 | 1 |
| D504 | DIODE MA161 | HDM0051 | 1 |
| D505 | DIODE MA161 | HDM0051 | 1 |
| D506 | DIODE MA161 | HDM0051 | 1 |
| D512 | DIODE 1S2075K | HDS0108 | 1 |
| D513 | DIODE 1S2075K | HDS0108 | 1 |
| D514 | DIODE 1S2075K | HDS0108 | 1 |
| D515 | DIODE 1S2075K | HDS0108 | 1 |
| D516 | DIODE 1S2075K | HDS0108 | 1 |
| D517 | DIODE 1S2075K | HDS0108 | 1 |
| D518 | DIODE 1S2075K | HDS0108 | 1 |
| D520 | DIODE 1S2075K | HDS0108 | 1 |
| IC504 | IC,DIGITAL HD7402P | IDH0179 | 1 |
| IC505 | IC,DIGITAL MC14053BCP | IDM0113 | 1 |
| IC506 | IC,DIGITAL MC14053BCP | IDM0113 | 1 |
| IC507 | IC,ANALOG TL081CP | ILT0037 | 1 |
| TR503 | TRANSISTOR 2SK106C | HTK0068 | 1 |
| TR504 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR505 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR506 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR508 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR509 | TRANSISTOR 2SA836D | HTA0105 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| TR510 | TRANSISTOR | 2SA836D | | | HTA0105 | 1 |
| TR511 | TRANSISTOR | 2SC458C | | | HTC0148 | 1 |
| R513 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R514 | R,CARBON | 1/4W | 2.2 | KOHM +-5% | RCR3060 | 1 |
| R515 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |
| R516 | R,SOLID | 1/2W | 10 | MOHM +-5% | RSE0311 | 1 |
| R517 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R518 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R519 | R,CARBON | 1/4W | 12 | KOHM +-5% | RCR3078 | 1 |
| R520 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R522 | R,METAL | 1/4W | 1.00 | KOHM +-1% | RME0664 | 1 |
| R523 | R,METAL | 1/4W | 22.1 | KOHM +-1% | RME0680 | 1 |
| R526 | R,METAL | 1/4W | 22 | KOHM +-5% | RMR2784 | 1 |
| R527 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R528 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R529 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R531 | R,METAL | 1/4W | 2.21 | KOHM +-1% | RME0668 | 1 |
| R532 | R,METAL | 1/4W | 3.09 | KOHM +-1% | RME0720 | 1 |
| R533 | R,CARBON | 1/4W | 2.2 | KOHM +-5% | RCR3060 | 1 |
| R534 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R535 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R541 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R542 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R543 | R,CARBON | 1/4W | 180 | KOHM +-5% | RCR3420 | 1 |
| R544 | R,CARBON | 1/4W | 47 | KOHM +-5% | RCR3092 | 1 |
| R545 | R,CARBON | 1/4W | 3.3 | KOHM +-5% | RCR3064 | 1 |
| R546 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R547 | R,METAL | 1/4W | 22 | KOHM +-5% | RMR2784 | 1 |
| R548 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R549 | R,METAL | 1/4W | 15.0 | KOHM +-1% | RME0678 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R552 | R,METAL | 1/4W | 3.32 | KOHM +-1% | RME0670 | 1 |
| R553 | R,METAL | 1/4W | 1.50 | KOHM +-1% | RME0666 | 1 |
| R556 | R,CARBON | 1/4W | 270 | OHM +-5% | RCR3038 | 1 |
| R557 | R,CARBON | 1/4W | 2.2 | KOHM +-5% | RCR3060 | 1 |
| R558 | R,CARBON | 1/4W | 470 | OHM +-5% | RCR3044 | 1 |
| R559 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |
| R561 | R,METAL | 1/2W | 4.32 | MOHM +-1% | RMR3283 | 1 |
| R562 | R,METAL | 1/2W | 1.43 | MOHM +-1% | RMR3282 | 1 |
| R563 | R,METAL | 1/8W | 715 | KOHM +-0.5% | RMR2262 | 1 |
| R564 | R,METAL | 1(4W | 429 | KOHM +-0.5% | RME0699 | 1 |
| R565 | R,METAL | 1/4W | 143 | KOHM +-0.5% | RME0718 | 1 |
| R566 | R,METAL | 1/4W | 71.5 | KOHM +-0.5% | RME0717 | 1 |
| R567 | R,METAL | 1/4W | 71.5 | KOHM +-0.5% | RME0717 | 1 |
| R568 | R,METAL | 1/4W | 17.8 | KOHM +-0.5% | RME0700 | 1 |
| R569 | R,METAL | 1/4W | 17.8 | KOHM +-0.5% | RME0700 | 1 |
| R570 | R,CARBON | 1/4W | 470 | KOHM +-5% | RCR3104 | 1 |
| R571 | R,CARBON | 1/4W | 1.2 | KOHM +-5% | RCR3054 | 1 |
| R572 | R,CARBON | 1/4W | 1.5 | KOHM +-5% | RCR3056 | 1 |
| R573 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R574 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R575 | R,CARBON | 1/4W | 12 | KOHM +-5% | RCR3078 | 1 |
| R576 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R577 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R578 | R,CARBON | 1/4W | 2.2 | KOHM +-5% | RCR3060 | 1 |
| R579 | R,CARBON | 1/4W | 820 | OHM +-5% | RCR3050 | 1 |
| R581 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |
| R582 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |
| R583 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |
| R584 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |
| R585 | R,CARBON | 1/4W | 22 | KOHM +-5% | RCR3084 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R586 | R,CARBON 1/4W 15 KOHM +-5% | RCR3306 | 1 |
| R587 | R,CARBON 1/4W 15 KOHM +-5% | RCR3306 | 1 |
| R588 | R,METAL 1/4W 4.75 KOHM +-1% | RME0672 | 1 |
| R589 | R,METAL 1/4W 4.75 KOHM +-1% | RME0672 | 1 |
| R590 | R,CARBON 1/4W 6.8 KOHM +-5% | RCR3072 | 1 |
| R591 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| R592 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| R593 | R,CARBON 1/4W 6.8 KOHM +-5% | RCR3072 | 1 |
| R594 | R,CARBON 1/4W 120 KOHM +-5% | RCR3417 | 1 |
| R595 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R596 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| R597 | R,CARBON 1/4W 330 OHM +-5% | RCR3040 | 1 |
| R598 | R,CARBON 1/4W 3.9 KOHM +-5% | RCR3066 | 1 |
| RV544 | VR,CARBON 1 KOHM & 500 KOHM (WITH SW) | HX3142080 | 1 |
| RV590 | VR,CARBON EVL-SOAA00B53 | RDE0004 | 1 |
| RV591 | VR,CARBON EVL-SOAA00B22 | RDE0012 | 1 |
| L558 | COIL FL-3H 100K | TLF0028 | 1 |
| L598 | COIL FL-5H 101K | TLF0067 | 1 |
| P502 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P503 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P504 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P506 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P505 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P508 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P509 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P510 | CONNECTOR 171825-3 | JBX0468 | 1 |
| S501 | SW,ROTARY S21P 3322/2219 | HX3142078 | 1 |
| S502 | SW,LEVER SLA225 | SSL0056 | 1 |
| C701 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C704 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C705 | C,CERAMIC 50 V 220 PF+-10% | CCC1027 | 1 |
| C715 | C,PLASTIC 50 V 10000 PF+-10% | CQA0097 | 1 |
| C723 | C,CERAMIC 50 V 10000 PF+80%-20% | CCC1030 | 1 |
| C725 | C,CERAMIC 50 V 10 PF+-0.5PF | CCC1002 | 1 |
| C726 | C,PLASTIC 1MF+0.01MF 100V+-0.5% | HX3142077-A | 1 |
| C727 | C,PLASTIC 50 V 4700 PF+-10% | CQA0095 | 1 |
| C728 | C,PLASTIC 1MF+0.01MF 100V+-0.5% | HX3142077-A | R |
| C729 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| CV701 | C,VARIABLE ECV-1ZW20×40 | CVE0019 | 1 |
| CV729 | C,VARIABLE ECV-1ZW20×40 | CVE0019 | 1 |
| D701 | DIODE MA161 | HDM0051 | 1 |
| D702 | DIODE MA161 | HDM0051 | 1 |
| D703 | DIODE MA161 | HDM0051 | 1 |
| D704 | DIODE 1S2075K | HDS0108 | 1 |
| D705 | DIODE 1S2075K | HDS0108 | 1 |
| IC702 | IC,DIGITAL HD74LS00P | IDH0467 | 1 |
| IC703 | IC,ANALOG TL081CP | ILT0037 | 1 |
| TR701 | TRANSISTOR 2SK106C | HTK0068 | 1 |
| TR702 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR703 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR704 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| P702 | CONNECTOR 171825-6 | JBX0470 | 1 |
| S701 | SW,ROTARY S21P 3322/2219 | HX3142078 | R |
| R701 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R702 | R,CARBON 1/4W 2.2 KOHM +-5% | RCR3060 | 1 |
| R703 | R,CARBON 1/4W 22 KOHM +-5% | RCR3084 | 1 |
| R704 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R705 | R,SOLID 1/2W 10 MOHM +-5% | RSE0311 | 1 |
| R706 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R707 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R708 | R,CARBON 1/4W 12 KOHM +-5% | RCR3078 | 1 |
| R709 | R,METAL 1W 22 KOHM +-5% | RMR2784 | 1 |
| R710 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R711 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| R716 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R717 | R,METAL 1/4W 2.21 KOHM +-1% | RME0668 | 1 |
| R718 | R,METAL 1/4W 3.09 KOHM +-1% | RME0720 | 1 |
| R722 | R,METAL 1/4W 1.00 KOHM +-1% | RME0664 | 1 |
| R723 | R,METAL 1/4W 22.1 KOHM +-1% | RME0680 | 1 |
| R726 | R,METAL 1/2W 1.43 MOHM +-1% | RMR3282 | 1 |
| R727 | R,METAL 1/2W 715 KOHM +-0.5% | RMR2262 | 1 |
| R728 | R,METAL 1/2W 715 KOHM +-0.5% | RMR2262 | 1 |
| R729 | R,METAL 1/4W 143 KOHM +-0.5% | RME0718 | 1 |
| R730 | R,METAL 1/4W 71.5 KOHM +-0.5% | RME0717 | 1 |
| R731 | R,METAL 1/4W 71.5 KOHM +-0.5% | RME0717 | 1 |
| R734 | R,METAL 1/4W 1.00 KOHM +-1% | RME0664 | 1 |
| R736 | R,METAL 1/4W 17.8 KOHM +-0.5% | RME0700 | 1 |
| R737 | R,METAL 1/4W 17.8 KOHM +-0.5% | RME0700 | 1 |
| R738 | R,METAL 1/4W 71.5 KOHM +-0.5% | RME0717 | 1 |
| R739 | R,CARBON 1/4W 2.7 KOHM +-5% | RCR3062 | 1 |
| R740 | R,CARBON 1/4W 470 KOHM +-5% | RCR3104 | 1 |
| RV734 | VR,CARBON EVL-SOAA00B22 | RDE0012 | 1 |
| C803 | C,AL ELYC 16 V 47 UF | CEC0170 | 1 |
| C820 | C,CERAMIC 50 V 5 PF+-0.25PF | CCC0999 | 1 |
| C821 | C,CERAMIC 50 V 5 PF+-0.25PF | CCC0999 | 1 |
| C822 | C,AL ELYC 16 V 47 UF | CEC0170 | 1 |
| TR822 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR823 | TRANSISTOR 2SC458C | HTC0148 | 1 |
| TR824 | TRANSISTOR 2SA836D | HTA0105 | 1 |
| TR825 | TRANSISTOR 2SA836D | HTA0105 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R801 | R,METAL | 1/4W | 3.92 | KOHM +-1% | RME0671 | 1 |
| R803 | R,METAL | 1/4W | 562 | OHM +-1% | RME0661 | 1 |
| R804 | R,METAL | 1/4W | 332 | OHM +-1% | RME0658 | 1 |
| R805 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R806 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R820 | R,METAL | 1/4W | 1.82 | KOHM +-1% | RME0667 | 1 |
| R821 | R,METAL | 1/4W | 1.82 | KOHM +-1% | RME0667 | 1 |
| R822 | R,METAL | 1/4W | 1.00 | KOHM +-1% | RME0664 | 1 |
| R823 | R,METAL | 1/4W | 1.00 | KOHM +-1% | RME0664 | 1 |
| R824 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R825 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R826 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R827 | R,CARBON | 1/4W | 4.7 | KOHM +-5% | RCR3068 | 1 |
| R891 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| R892 | R,CARBON | 1/4W | 22 | OHM +-5% | RCR3012 | 1 |
| PEF-477 | PCB | PB-3(PEF-476,477,487) | | | 116442 | R |

# ELECTRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-478)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C301 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C304 | C,CERAMIC 50 V 5 PF+-0.25PF | CCC0999 | 1 |
| C305 | C,CERAMIC 50 V 22 PF+-5% | CCC1007 | 1 |
| C306 | C,PLASTIC 50 V 3300 PF+-10% | CQA0094 | 1 |
| C307 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C309 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C311 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C324 | C,CERAMIC 50 V 5 PF+-0.25PF | CCC0999 | 1 |
| C326 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C327 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C328 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C329 | C,CERAMIC 50 V 8 PF+-0.5PF | CCC1001 | 1 |
| C330 | C,CERAMIC 50 V 15 PF+-5% | CCC1004 | 1 |
| C331 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| C332 | C,CERAMIC 500 V 1 PF+-0.25PF | CCC1353 | 1 |
| C333 | C,CERAMIC 500 V 1 PF+-0.25PF | CCC1353 | 1 |
| C334 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C335 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C338 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C341 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C342 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C343 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C344 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C345 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C346 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C347 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C348 | C,CERAMIC 50 V 1000 PF+80%-20% | CCC1029 | 1 |
| CV304 | C,VALIABLE ECV-1ZW10×40 | CVE0024 | 1 |
| CV322 | C,VALIABLE ECV-1ZW20×40 | CVE0019 | 1 |
| CV329 | C,VALIABLE ECV-1ZW10×40 | CVE0024 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| D301 | DIODE HZ7B | HDH0040 | 1 |
| D302 | DIODE HZ5B | HDH0029 | 1 |
| D303 | DIODE HZ7B | HDH0040 | 1 |
| TR301 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR302 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR303 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR304 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR305 | TRANSISTOR 2SC1374H | HTC0328 | 1 |
| TR306 | TRANSISTOR 2SC1374H | HTC0328 | 1 |
| TR307 | TRANSISTOR 2SD668A-C | HTD0100 | 1 |
| TR308 | TRANSISTOR 2SD668A-C | HTD0100 | 1 |
| TR309 | TRANSISTOR 2SB648A-C | HTB0087 | 1 |
| TR310 | TRANSISTOR 2SB648A-C | HTB0087 | 1 |
| TR311 | TRANSISTOR 2SA741H | HTA0088 | 1 |
| TR312 | TRANSISTOR 2SA741H | HTA0088 | 1 |
| L336 | COIL FL-3H R47M | TLF0052 | 1 |
| L337 | COIL FL-3H R47M | TLF0052 | 1 |
| P301 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P302 | CONNECTOR 171825-6 | JBX0470 | 1 |
| J305 | PIN FOR CONNECTOR | HX8193940 | 1 |
| J306 | PIN FOR CONNECTOR | HX8193940 | 1 |
| R301 | R,METAL 1/4W 100 OHM +-1% | RME0652 | 1 |
| R302 | R,METAL 1/4W 100 OHM +-1% | RME0652 | 1 |
| R303 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| R304 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R305 | R,CARBON 1/4W 680 OHM +-5% | RCR3048 | 1 |
| R306 | R,CARBON 1/4W 8.2 KOHM +-5% | RCR3074 | 1 |
| R307 | R,METAL 1/4W 1.21 KOHM +-1% | RME0665 | 1 |
| R308 | R,METAL 1/4W 1.21 KOHM +-1% | RME0665 | 1 |
| R309 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R310 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R311 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R312 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R319 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R320 | R,METAL | 1/4W | 150 | OHM +-1% | RME0654 | 1 |
| R321 | R,METAL | 1/4W | 150 | OHM +-1% | RME0654 | 1 |
| R322 | R,CARBON | 1/4W | 180 | OHM +-5% | RCR3034 | 1 |
| R323 | R,CARBON | 1/4W | 150 | OHM +-5% | RCR3032 | 1 |
| R324 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R325 | R,METAL | 1/4W | 1.00 | KOHM +-1% | RME0664 | 1 |
| R326 | R,METAL | 1/4W | 1.00 | KOHM +-1% | RME0664 | 1 |
| R327 | R,METAL | 1/4W | 274 | OHM +-1% | RME0715 | 1 |
| R328 | R,METAL | 1/4W | 274 | OHM +-1% | RME0715 | 1 |
| R329 | R,METAL | 1/4W | 681 | OHM +-1% | RME0662 | 1 |
| R330 | R,METAL | 1/4W | 681 | OHM +-1% | RME0662 | 1 |
| R331 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R332 | R,METAL | 1 W | 10 | KOHM +-5% | RMR2782 | 1 |
| R333 | R,METAL | 1 W | 10 | KOHM +-5% | RMR2782 | 1 |
| R334 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R335 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R336 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R337 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R338 | R,CARBON | 1/2W | 22 | KOHM +-5% | RCR3191 | 1 |
| R339 | R,METAL | 1 W | 10 | KOHM +-5% | RMR2782 | 1 |
| R340 | R,METAL | 1 W | 10 | KOHM +-5% | RMR2782 | 1 |
| R341 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R342 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R343 | R,CARBON | 1/4W | 2.2 | KOHM +-5% | RCR3060 | 1 |
| R344 | R,CARBON | 1/4W | 2.2 | KOHM +-5% | RCR3060 | 1 |
| R345 | R,METAL | 1/4W | 182 | OHM +-1% | RME0655 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R346 | R,METAL | 1/4W | 182 | OHM +-1% | RME0655 | 1 |
| R347 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R348 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R349 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R350 | R,CARBON | 1/4W | 47 | OHM +-5% | RCR3020 | 1 |
| R351 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| C1034 | C,CERAMIC | 500 | V10000 | pF+-10% | CCD0218 | 1 |
| D1032 | DIODE | HZ22 | | | HDH0072 | 1 |
| R1032 | R,CARBON | 1/4W | 68 | KOHM +-5% | RCR3096 | 1 |
| R1033 | R,CARBON | 1/4W | 47 | KOHM +-5% | RCR3092 | 1 |
| R1034 | R,CARBON | 1/4W | 33 | KOHM +-5% | RCR3088 | 1 |
| R1036 | R,CARBON | 1/4W | 220 | OHM +-5% | RCR3036 | 1 |
| RV1032 | VR,CARBON | EVT-SOAA00B25 | | | RDE0029 | 1 |
| RV1033 | VR,CARBON | EVT-SOAA00B54 | | 50K OHM | RDE0017 | 1 |
| PEF-478 | PCB | PB1 (PEF-478 486) | | | HX116440 | R |
| | | | | | HX283881 | R |
| | | | | | HX283882 | R |

# ELECTRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-479)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C828 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C832 | C,CERAMIC 50 V 470 PF+-10% | CCC1162 | 1 |
| C840 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C844 | C,CERAMIC 500 V 0.5 PF+-0.25PF | CCC0111 | 1 |
| C845 | C,CERAMIC 500 V 0.5 PF+-0.25PF | CCC0111 | 1 |
| C846 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C847 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C849 | C,CERAMIC 50 V10000 PF+80%-20% | CCC1030 | 1 |
| C854 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C855 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C860 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| C842 | C,CERAMIC 50 V10000 PF+80%-20% | CCC1030 | 1 |
| C843 | C,CERAMIC 50 V10000 PF+80%-20% | CCC1030 | 1 |
| D852 | DIODE 1S2075K | HDS0108 | 1 |
| D853 | DIODE 1S2075K | HDS0108 | 1 |
| TR828 | TRANSISTOR 2SA836D | HTA0105 | 1 |
| TR829 | TRANSISTOR 2SA836D | HTA0105 | 1 |
| TR840 | TRANSISTOR 2SA836D | HTA0105 | 1 |
| T841 | TRANSISTOR 2SA836D | HTA0105 | 1 |
| TR846 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR847 | TRANSISTOR 2SA781K | HTA0099 | 1 |
| TR852 | TRANSISTOR 2SB648A-C | HTB0087 | 1 |
| TR853 | TRANSISTOR 2SB648A-C | HTB0087 | 1 |
| TR856 | TRANSISTOR 2SD668A-C | HTD0100 | 1 |
| TR857 | TRANSISTOR 2SD668A-C | HTD0100 | 1 |
| R828 | R,METAL 1/4W 22.1 KOHM +-1% | RME0680 | 1 |
| R829 | R,METAL 1/4W 22.1 KOHM +-1% | RME0680 | 1 |
| R830 | R,CARBON 1/4W 1.5 KOHM +-5% | RCR3056 | 1 |
| R831 | R,CARBON 1/4W 120 OHM +-5% | RCR3030 | 1 |
| R832 | R,CARBON 1/4W 6.8 KOHM +-5% | RCR3072 | 1 |

| Symbol | Description | | | | Code | Qty |
|---|---|---|---|---|---|---|
| R840 | R,METAL | 1/4W | 22.1 | KOHM +-1% | RME0680 | 1 |
| R841 | R,METAL | 1/4W | 22.1 | KOHM +-1% | RME0680 | 1 |
| R842 | R,METAL | 1/4W | 1.82 | KOHM +-1% | RME0667 | 1 |
| R843 | R,METAL | 1/4W | 1.82 | KOHM +-1% | RME0667 | 1 |
| R844 | R,METAL | 1 W | 22 | KOHM +-5% | RMR2784 | 1 |
| R845 | R,METAL | 1 W | 22 | KOHM +-5% | RMR2784 | 1 |
| R846 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R847 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R848 | R,CARBON | 1/4W | 220 | KOHM +-5% | RCR3102 | 1 |
| R849 | R,CARBON | 1/4W | 220 | KOHM +-5% | RCR3102 | 1 |
| R850 | R,CARBON | 1/4W | 15 | KOHM +-5% | RCR3080 | 1 |
| R851 | R,CARBON | 1/4W | 15 | KOHM +-5% | RCR3080 | 1 |
| R852 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R853 | R,CARBON | 1/4W | 1.0 | KOHM +-5% | RCR3052 | 1 |
| R854 | R,METAL | 1 W | 22 | KOHM +-5% | RMR2784 | 1 |
| R855 | R,METAL | 1 W | 22 | KOHM +-5% | RMR2784 | 1 |
| R856 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R857 | R,CARBON | 1/4W | 100 | OHM +-5% | RCR3028 | 1 |
| R862 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R863 | R,CARBON | 1/4W | 330 | OHM +-5% | RCR3040 | 1 |
| R858 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R859 | R,CARBON | 1/4W | 10 | OHM +-5% | RCR3004 | 1 |
| R860 | R,CARBON | 1/4W | 100 | KOHM +-5% | RCR3100 | 1 |
| RV830 | VR,METAL | TM10K(PV)1SB | | 1K OHM | RNT0029 | 1 |
| RV831 | VR,METAL | TM10K(PV)1SB | | 100 OHM | RNT0028 | 1 |
| RV842 | VR,METAL | TM10K(PV)1SB | | 500 OHM | RNT0039 | 1 |
| P801 | CONNECTOR | 171825-3 | | | JBX0468 | 1 |
| P802 | CONNECTOR | 171825-6 | | | JBX0470 | 1 |
| C905 | C,CERAMIC | 500 V | 0.5 | PF+-0.25PF | CCC0111 | 1 |
| C906 | C,CERAMIC | 500 V | 10000 | PF+-10% | CCD0218 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C911 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C902 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C913 | C,CERAMIC 50 V 47 PF+-5% | CCC1014 | 1 |
| D901 | DIODE 1S2075k | HDS0108 | 1 |
| D902 | DIODE 1S2075k | HDS0108 | 1 |
| D908 | DIODE 1S2075k | HDS0108 | 1 |
| R901 | R,METAL 1/4W 3.32 KOHM +-1% | RME0670 | 1 |
| R902 | R,CARBON 1/4W 3.9 KOHM +-5% | RCR3066 | 1 |
| R903 | R,CARBON 1/4W 56 KOHM +-5% | RCR3094 | 1 |
| R904 | R,CARBON 1/4W 1.5 KOHM +-5% | RCR3056 | 1 |
| R905 | R,METAL 1 W 22 KOHM +-5% | RMR2784 | 1 |
| R906 | R,CARBON 1/4W 100 KOHM +-5% | RCR3100 | 1 |
| R907 | R,CARBON 1/4W 12 KOHM +-5% | RCR3078 | 1 |
| R908 | R,CARBON 1/4W 1.5 KOHM +-5% | RCR3056 | 1 |
| R909 | R,CARBON 1/2W 33 KOHM +-5% | RCR3195 | 1 |
| R910 | R,CARBON 1/4W 220 OHM +-5% | RCR3036 | 1 |
| R911 | R,CARBON 1/4W 22 OHM +-5% | RCR3012 | 1 |
| R912 | R,CARBON 1/4W 100 OHM +-5% | RCR3028 | 1 |
| R913 | R,CARBON 1/4W 2.2 KOHM +-5% | RCR3060 | 1 |
| R921 | R,CARBON 1/4W 3.9 KOHM +-5% | RCR3066 | 1 |
| R931 | R,CARBON 1/4W 22 KOHM +-5% | RCR3084 | 1 |
| R932 | R,CARBON 1/4W 82 KOHM +-5% | RCR3098 | 1 |
| R935 | R,METAL 1 W 10 MOHM +-5% | HX3142076-B | 1 |
| R936 | R,CARBON 1/2W 1.8 MOHM +-5% | RCR3476 | 1 |
| TR901 | TRANSISTOR 2SC641K-C | HTC0192 | 1 |
| TR904 | TRANSISTOR 2SC1906 | HTC0338 | 1 |
| TR905 | TRANSISTOR 2SD668A-C | HTD0100 | 1 |
| TR908 | TRANSISTOR 2SB648A-C | HTB0087 | 1 |
| TR936 | TRANSISTOR 2SA778AK | HTA0104 | 1 |
| P901 | CONNECTOR 171825-3 | JBX0468 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| P902 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P903 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P904 | CONNECTOR 171825-3 | JBX0468 | 1 |
| C1001 | C,PLASTIC 50 V47000 PF+-10% | CQA0101 | 1 |
| C1002 | C,AL ELYC 25 V 100 UF | CEC0177 | 1 |
| C1005 | C,PLASTIC 50 V47000 PF+-10% | CQA0101 | 1 |
| C1012 | C,CERAMIC 2000 V 4700 PF+-10% | CCD0221 | 1 |
| C1013 | C,CERAMIC 2000 V 4700 PF+-10% | CCD0221 | 1 |
| C1016 | C,CERAMIC 2000 V 100 PF+-10% | CCC1366 | 1 |
| C1020 | C,CERAMIC 500 V10000 PF+-10% | CCD0218 | 1 |
| C1021 | C,AL ELYC 160 V 1 UF | CEC0213 | 1 |
| C1023 | C,CERAMIC 2000 V 4700 PF+-10% | CCD0221 | 1 |
| C1025 | C,CERAMIC 2000 V 4700 PF+-10% | CCD0221 | 1 |
| D1013 | DIODE Y10GA | HDY0031 | 1 |
| D1020 | DIODE HZ22 | HDH0072 | 1 |
| D1021 | DIODE 1SS83 | HDS0250 | 1 |
| D1022 | DIODE 1SS83 | HDS0250 | 1 |
| D1023 | DIODE 1SS83 | HDS0250 | 1 |
| D1024 | DIODE 1SS83 | HDS0250 | 1 |
| IC1001 | IC,ANALOG TL081CP | ILT0037 | 1 |
| TR1006 | TRANSISTOR 2SC1061C | HTC0032 | 1 |
| R1001 | R,METAL 1/4W 182 KOHM +-1% | RME0721 | 1 |
| R1002 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R1003 | R,CARBON 1/4W 100 KOHM +-5% | RCR3100 | 1 |
| R1004 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R1005 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| R1006 | R,CARBON 1/4W 33 OHM +-5% | RCR3016 | 1 |
| R1014 | R,CARBON 1/4W 10 KOHM +-5% | RCR3076 | 1 |
| R1015 | R,METAL 1 W 22 MOHM +-1% | HX3142076-A | 1 |
| R1016 | R,CARBON 1/2W 3.3 MOHM +-5% | RCR4282 | 1 |

| Symbol | Description | | | Code | Qty |
|---|---|---|---|---|---|
| R1020 | R,CARBON | 1/4W 680 | KOHM +-5% | RCR3105 | 1 |
| R1024 | R,SOLID | 1/2W 10 | MOHM +-5% | RSE0311 | 1 |
| RV1021 | VR,CARBON | EVT-S0AA00B25 | | RDE0029 | 1 |
| NL1024 | LAMP | NE-2 | | ELL0019 | 1 |
| NL1025 | LAMP | NE-2 | | ELL0019 | 1 |
| T1001 | XFMR | HIGH VOLTAGE XFMR (FOR V-550) | | HX3142082 - A | 1 |
| MUT1001 | MULTIPLIER | 8.5KV (WITH ANODE CAP) | | HX3142083 - A | 1 |
| F1001 | FUSE | MF61NM 1 (1A 250V)JIS | | EFG0344 | 1 |
| FH1001 | SOCKET,FUS | F-3265 1P PHENOLIT RESIN | | EFH0026 | 1 |
| D1101 | DIODE | M4G-1 | | HDM0034 | 1 |
| D1102 | DIODE | 1S2075K | | HDS0108 | 1 |
| D1103 | DIODE | 1S2075K | | HDS0108 | 1 |
| D1111 | DIODE | M4C-1 | | HDM0033 | 1 |
| D1114 | DIODE | V06C | | HDV0019 | 1 |
| D1121 | DIODE | V06C | | HDV0019 | 1 |
| D1141 | DIODE | V06C | | HDV0019 | 1 |
| D1142 | DIODE | V06C | | HDV0019 | 1 |
| IC1101 | IC,ANALOG | HA17458GS | | ILH0054 | 1 |
| IC1111 | IC,DIGITAL | UA7812UC | | IDM0318 | 1 |
| IC1121 | IC,DIGITAL | UA7912UC | | IDM0319 | 1 |
| IC1131 | IC,DIGITAL | UA7805UC | | IDM0320 | 1 |
| TR1101 | TRANSISTOR | 2SD478C | | HTD0053 | 1 |
| TR1102 | TRANSISTOR | 2SD478C | | HTD0053 | 1 |
| TR1161 | TRANSISTOR | 2SC1061C | | HTC0032 | 1 |
| TR1162 | TRANSISTOR | 2SC458C | | HTC0148 | 1 |
| R1101 | R,CARBON | 1/4W 15 | KOHM +-5% | RCR3080 | 1 |
| R1102 | R,CARBON | 1/4W 10 | KOHM +-5% | RCR3076 | 1 |
| R1103 | R,CARBON | 1/4W 10 | KOHM +-5% | RCR3076 | 1 |
| R1104 | R,METAL | 1/4W 100 | KOHM +-1% | RME0688 | 1 |
| R1105 | R,METAL | 1/4W 12.1 | KOHM +-1% | RME0677 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R1111 | R,METAL 2 W 33 OHM +-5% | RMR2790 | 1 |
| R1112 | R,CARBON 1/4W 680 OHM +-5% | RCR3048 | 1 |
| R1113 | R,CARBON 1/4W 47 OHM +-5% | RCR3020 | 1 |
| R1114 | R,METAL 1/4W 10.0 KOHM +-1% | RME0676 | 1 |
| R1115 | R,CARBON 1/4W 2.2 KOHM +-5% | RCR3060 | 1 |
| R1121 | R,METAL 2 W 27 OHM +-5% | RMR3151 | 1 |
| R1122 | R,METAL 1/4W 10.0 KOHM +-1% | RME0676 | 1 |
| R1131 | R,METAL 2 W 47 OHM +-5% | RMR2791 | 1 |
| R1151 | R,CARBON 1/4W 470 KOHM +-5% | RCR3104 | 1 |
| R1152 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| R1162 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| RV1111 | VR,CARBON EVL-SOAA00B53 | RDE0004 | 1 |
| R1106 | R,CARBON 1/4W 6.8 OHM +-5% | RCR3003 | 1 |
| R1107 | R,CARBON 1/4W 100 KOHM +-5% | RCR3100 | 1 |
| C1101 | C,AL ELYC 160 V 100 UF | CEC0340 | 1 |
| C1102 | C,AL ELYC 160 V 10 UF | CEC0214 | 1 |
| C1111 | C,AL ELYC 25 V 2200 UF | CEC0347 | 1 |
| C1112 | C,AL ELYC 25 V 100 UF | CEC0177 | 1 |
| C1113 | C,AL ELYC 16 V 100 UF | CEC0364 | 1 |
| C1121 | C,AL ELYC 25 V 2200 UF | CEC0347 | 1 |
| C1122 | C,AL ELYC 25 V 100 UF | CEC0177 | 1 |
| C1123 | C,PLASTIC 50 V10000 PF+-10% | CQA0097 | 1 |
| C1131 | C,CERAMIC 50 V10000 PF+80%-20% | CCC1030 | 1 |
| C1132 | C,AL ELYC 25 V 100 UF | CEC0177 | 1 |
| C1141 | C,AL ELYC 100 V 100 UF | CEC0209 | 1 |
| C1151 | C,PLASTIC 50 V 0.1 MF+-10% | CQA0103 | 1 |
| P1105 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P1101 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P1102 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P1103 | CONNECTOR 171825-6 | JBX0470 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| P1104 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P1106 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P1107 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P1108 | CONNECTOR 171825-6 | JBX0470 | 1 |
| C1107 | C,PLASTIC 50 V 1000 PF+-10% | CQA0091 | 1 |
| 9 | PCB PB-1 (PEF-478～486) | HX116440 | 1 |
| | | HX283881 | R |
| | | HX283882 | R |

# ELECRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-480)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| C1303 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| C1304 | C,AL ELYC 25 V 10 UF | CEC0175 | 1 |
| D1301 | DIODE HZ7B | HDH0040 | 1 |
| D1302 | DIODE HZ7B | HDH0040 | 1 |
| D1303 | DIODE 1S2075K | HDS0108 | 1 |
| D1304 | DIODE 1S2075K | HDS0108 | 1 |
| D1401 | DIODE SR103D (WITH MOUNT) | HDS0234 | 1 |
| R1301 | R,CARBON 1/4W 1.0 KOHM +-5% | RCR3052 | 1 |
| R1302 | R,CARBON 1/4W 220 OHM +-5% | RCR3036 | 1 |
| R1303 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| R1304 | R,CARBON 1/4W 4.7 KOHM +-5% | RCR3068 | 1 |
| RV1301 | VR,CARBON 1/2W 10KOHM+-20% & 10KOHM+-20% (WITH UL SW) | HX3142075-A | 1 |
| RV1302 | VR,CARBON 1/2W 10KOHM+-20% & 10KOHM+-20% | HX3142092-A | 1 |
| RV1303 | VR,CARBON 1/2W 10KOHM+-20% & 10KOHM+-20% | HX3142092-A | 1 |
| P1302 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P1303 | CONNECTOR 171825-6 | JBX0470 | 1 |
|  | SPACER FOR TO-1, TO-18 TYPE | H5487338～39 | 1 |
| C1201 | C,AL ELYC 16 V 47 UF | CEC0170 | 1 |
| C1202 | C,CERAMIC 50 V10000 PF+80%-20% | CCC1030 | 1 |
| C1203 | C,PLASTIC 50 V22000 PF+-10% | CQA0099 | 1 |
| IC1201 | IC,ANALOG HA17555GS | ILH0063 | 1 |
| IC1202 | IC,DIGITAL MC14011BCP | IDM0169 | 1 |
| R1201 | R,CARBON 1/4W 10 KOHM +-5% | RCR3076 | 1 |
| R1202 | R,CARBON 1/4W 10 OHM +-5% | RCR3004 | 1 |
| R1203 | R,CARBON 1/4W 27 KOHM +-5% | RCR3086 | 1 |
| R1204 | R,CARBON 1/4W 10 OHM +-5% | RCR3004 | 1 |
| R1205 | R,METAL 1/4W 10.0 KOHM +-1% | RME0676 | 1 |
| R1206 | R,METAL 1/4W 475 OHM +-1% | RME0660 | 1 |
| R1207 | R,CARBON 1/4W 10 OHM +-5% | RCR3004 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| RV1203 | VR,CARBON EVL-SOAA00B14 | RDE0034 | 1 |
| RV1205 | VR,CARBON EVL-SOAA00B23 | RDE0015 | 1 |
| P1201 | CONNECTOR 171825-3 | JBX0468 | 1 |
| P1202 | CONNECTOR 171825-3 | JBX0468 | 1 |
| PEF-480 | PCB PB-1 (PEF478～486) | HX116440 | R |
| | | HX283881 | R |
| | | HX283882 | R |

## CIRCUIT BOARD (PEF-481)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R1030 | R,CARBON 1/4W 10 KOHM +-5% | RCR3076HA | 1 |
| R1031 | R,CARBON 1/4W 100 KOHM +-5% | RCR3100HA | 1 |
| V1101 | CRT 150BCB31 | DPX0061 | 1 |
| J1011 | SOCKET PS-085 | JSP0001 | 1 |
| P1030 | CONNECTOR 171825-3 | JBX0468 | 1 |
| C1030 | C,CERAMIC 50 V 100 PF+-10% | CCC1025VA | 1 |
| PEF-481 | PCB PB-1 (PEF-478～486) | HX116440 | R |
| | | HX283881 | R |
| | | HX283882 | R |

# ELECTRICAL REPLACEABLE PARTS LIST
## CIRCUIT BOARD (PEF-482,483)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| S1 | SW,SLIDE SSB023 L=9 NS PCB | SSV0042 | 1 |
| S101 | SW,SLIDE SSB023 L=9 NS PCB | SSV0042 | 1 |
| C1 | C,PLASTIC 600 V22000 PF+-10% | CQX0071 | 1 |
| C101 | C,PLASTIC 600 V22000 PF+-10% | CQX0071 | 1 |
| PEF-482 | PCB PB-1 (PEF-478～486) | HX116440 | R |
| | | HX283881 | R |
| | | HX283882 | R |
| PEF-483 | PCB PB-1 (PEF-478～486) | HX116440 | R |
| | | HX283881 | R |
| | | HX283882 | R |

# ELECTRICAL REPLACEABLE PARTS LIST

## CIRCUIT BOARD (PEF-484b)

| Symbol | Description | Code | Qty |
|---|---|---|---|
| R880 | R,METAL 1/4W 6.81 KOHM +-1% | RME0674 | 1 |
| R881 | R,CARBON 1/4W 820 OHM +-5% | RCR3050 | 1 |
| R882 | R,METAL 1/4W 2.21 KOHM +-1% | RME0668 | 1 |
| R883 | R,METAL 1/4W 1.00 KOHM +-1% | RME0664 | 1 |
| R884 | R,METAL 1/4W 6.81 KOHM +-1% | RME0674 | 1 |
| R885 | R,METAL 1/4W 10.0 KOHM +-1% | RME0676 | 1 |
| R886 | R,METAL 1/4W 1.00 KOHM +-1% | RME0664 | 1 |
| R887 | R,CARBON 1/4W 1.5 KOHM +-5% | RCR3056 | 1 |
| R888 | R,CARBON 1/4W 3.3 KOHM +-5% | RCR3064 | 1 |
| RV552 | VR,CARBON 0.2W 10KOHM +-20% & 50KOHM +-20% (WITH SW) | HX3142080-A | 1 |
| RV555 | VR,CARBON EVL-SOAA00B14 | RDE0034 | 1 |
| RV556 | VR,CARBON EVL-SOAA00B14 | RDE0034 | 1 |
| RV557 | VR,WIRE MF220D 2KOHM +-5% | RXM0009 | 1 |
| | DIAL DFA-N | RZY0002 | 1 |
| IC810 | IC,ANALOG HA17458GS | ILH0054 | 1 |
| P510 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P511 | CONNECTOR 171825-6 | JBX0470 | 1 |
| P512 | CONNECTOR 171825-3 | JBX0468 | 1 |
| J512 | CONNECTOR ASSEMBLY HB | HX3142085-HB | R |
| PEF-484b | PCB PB-1 (PEF-478~486) | HX116440 | R |
| | | HX283881 | R |
| | | HX283882 | R |

# ELECTRICAL REPLACEABLE PARTS LIST

## CABINET

| Symbol | Description | | Code | Qty |
|---|---|---|---|---|
| T1401 | XFMR | For V-550 | HX3142118-A | 1 |
| | BAND | SKB-4M | ERL0093 | 1 |
| | ADHESIVE AGENT | | VEB0003 | R |
| | FASTENER | NYLON | ERL0002 | 2 |
| | WIRE STICKER | T-25 | ERL0012 | 1 |
| F1401 | FUSE | MF61NM 2 (2A 250V)JIS | EFG0352 | 1 |
| | SOCKET,FUS | SN-1301 | EFH0193 | 1 |
| R1 | R,CARBON | 1/4W 10 OHM +-5% | RCR3004 | 1 |
| R101 | R,CARBON | 1/4W 10 OHM +-5% | RCR3004 | 1 |
| J1401 | COAX.CON | BNC071 | JHB0088 | 1 |
| J1402 | COAX.CON | BNC071 | JHB0088 | 1 |
| J1403 | COAX.CON | BNC071 | JHB0088 | 1 |
| J1404 | COAX.CON | BNC071 | JHB0088 | 1 |
| J1405 | COAX.CON | BNC071 | JHB0088 | 1 |
| PEF-485 | PCB | PB-1(PEF-478～486) | HX116440 | R |
| | | | HX283881 | R |
| | | | HX283882 | R |
| PEF-486 | PCB | PB-1(PEF-478～486) | HX116440 | R |
| | | | HX283881 | R |
| | | | HX283882 | R |
| TP1401 | TERMINAL | BLACK | HX4114183-A | 1 |
| TP1402 | TERMINAL | Z-048 | HX8338351 | 1 |
| L1101 | COIL | For V-550 | HX3142116 | 1 |
| C1205 | C,PLASTIC | AMS 102K50 (50V 0.001UF) | CQA0003 | 1 |
| PL1401~3 | LAMP | 14V 80MA | HX8329332 | 3 |
| RV1401 | VR,CARBON | EVM-R7GS20B26 | RDE0028 | 1 |
| DL1401 | DELAY LINE | 758DL 100NS 1860HM | HX8311698 | 1 |
| J1406 | CONNECTOR | CM3 (C-170) | JJC0026 | 1 |
| P1406 | CORD SET | 〈For 120V Set〉SVT 3X#18 VM0033-VM0076B 8FEET, GRY | BBZ0184 | 1 |
| | | 〈For 220V or 240V Set〉 VM0099-VM0081 8FEET | BBZ0183 | (1) |
| | CORD BAND | CB-3 | ERS0004 | 1 |

| Symbol | Description | Code | Qty |
|---|---|---|---|
| | CONNECTOR ASSEMBLY For V-550 | HX3142084 A | 1 |
| | | HX3142085 A | 0 |
| | TERMINAL B5 | HX324662 B5 | 4 |
| | TERMINAL D3 | HX324662 D3 | 1 |
| | BRAIDED WIRE 0.75SQ PLATED TIN | BSE0001 | 1 |
| | WIRE, NEWFL 1/0.5WHT | BB10042 | |
| | WIRE, VINYL UL-1015#22 YEL | BBA0465 | |
| | WIRE, VINYL WL1H12/0.18 BLK | BBA0041 | |
| | WIRE, VINYL WL1H12/0.18 WHT | BBA0043 | |
| | WIRE PLATED SOLDER | BSB0001 | |

# MECHANICAL REPLACEABLE PARTS LIST

| Symbol | Description | Code | Qty | Remarks |
|---|---|---|---|---|
| 1 | Cover | 288054-A | 1 | |
| 2 | Cover, bottom | 3149269-A | 1 | |
| 3 | Chassis, front | 117440-AA | 1 | |
| 4 | Chassis, rear | 288055-AA | 1 | |
| 5 | Chassis | 288056-A | 1 | |
| 6 | Angle | 3149270-A | 1 | |
| 7 | Angle | 3149271-A | 1 | |
| 8 | Angle | 3149272-A | 1 | |
| 9 | Angle | 3149273-A | 1 | |
| 10 | CRT band (1) | 8330671-A | 1 | |
| 11 | CRT band (2) | 3149274-A | 1 | |
| 12 | Plate, shield | 3149275-A | 1 | |
| 13 | Bracket, support | 8338296-A | 1 | |
| 14 | Bracket, PEF478 | 8330676-A | 1 | |
| 15 | Bracket, PEF479 | 3149277-A | 1 | |
| 16 | Bracket | 8330677-A | 1 | |
| 17 | Plate, shield | 8330678-A | 1 | |
| 21 | Plate, shield | 8338330-A | 1 | |
| 24 | Plate | 3149278-A | 2 | |
| 28 | Bracket, MD | 8345458-A | 1 | |
| 29 | Plate | 8345476-A | 2 | |
| 51 | Shield band | 8330708-A | 1 | |
| 69 | Rubber | 8330710-A | 1 | |
| 52 | Shield case | 3149287-B | 1 | |
| 53 | Handle | 3156107-A | 1 | |
| 54 | Lock, handle | 8345467-A | 2 | |
| 56 | Panel, front | 292449~50-A | 1 | |
| 57 | Panel, rear | 3149298~99-A | 1 | |
| 59 | Bezel | 288060-A | 1 | |
| 60 | Cover, side | 3149315-A | 2 | |

| Symbol | Description | Code | Qty | Remarks |
|---|---|---|---|---|
| 61 | Cover, rear | 3149316-A | 1 | |
| 62 | Foot, rear | 3149317-A | 4 | |
| 63 | Foot | 3140755-A | 4 | |
| 64 | Bush | ERR0073 | 1 | B-312-250 |
| 65 | Spacer | XCI0097 | 2 | PS-4N(6.4H) |
| 66 | Filter | 3149318-A | 1 | |
| 68 | Rubber | 3144055-B | 2 | |
| 70 | Rubber | 8330712-C | 1 | |
| 71 | Cushion | 8330711-B | 2 | |
| 72 | Cushion | 8330711-F | 1 | |
| 73 | Knob | 3149319-A | 1 | AT |
| 74 | Knob | 3149320-A | 1 | BT |
| 75 | Knob | 3149321-A | 6 | S18 |
| 76 | Knob | 3149322-B | 1 | S24 |
| 77 | Knob | 3149323-A | 2 | URV |
| 78 | Knob | 3149324-A | 4 | S18B |
| 79 | Knob | 3122685-D | 2 | 0022 |
| 80 | Knob | 3149325-B | 6 | LSW |
| 81 | Label | 8316162-A | 1 | SER.NO. |
| 82 | Label | 8345932-A | 1 | |
| 83 | Rivet | 8340163-B | 6 | NO.1027 |
| 84 | Rivet | 8340164-A | 4 | NO.113 |
| 83 | Support | 8340165-A | 5 | LCBS-03N |
| 86 | Support | 8340165-G | 4 | LCBS-014N |
| 87 | Bush | 8340166-A | 1 | CE-012 |
| 90A | Label, 120V | 8330692-A | 1 | U TYPE |
| 90B | Label, 220V | 8330693-A | 1 | E TYPE |
| 90C | Label, 240V | 8330694-A | 1 | K TYPE |
| 301 | Screw, sems (sw.w) | XCA0661 | 8 | M3 × 8 |
| 302 | Screw, sems (sw) | XCA1319 | 6 | M4 × 12 |

| Symbol | Description | Code | Qty | Remarks |
|---|---|---|---|---|
| 303 | Screw, sems (sw.w) | 8340167-C | 4 | M4 × 20 |
| 306 | Screw | XCA6205 | 3 | M2 × 5 |
| 308 | Screw | XCA6308 | 21 | M3 × 8 |
| 309 | Screw | XCA6312 | 3 | M3 × 12 |
| 310 | Screw | XCA1797 | 2 | M3 × 20 |
| 311 | Screw | XCA6410 | 2 | M4 × 10 |
| 313 | Screw, black | XCA1820 | 4 | M3 × 10 |
| 315 | Screw, flat | XCA0168 | 4 | M2.6 × 4 |
| 316 | Screw, flat | XCA7306 | 29 | M3 × 6 |
| 401 | Washer, spring | XCA1879 | 4 | M3 |
| 402 | Washer, spring | XCA1881 | 2 | M4 |
| 403 | Washer | XCA1855 | 3 | M3 |
| 404 | Washer | XCA1857 | 2 | M4 |
| 405 | Nut | XCA1706 | 4 | M3 |
| 406 | Nut | XCA1707 | 2 | M4 |
| 501 | Board | PEF-475 | 1 | |
| 18 | Bracket, LSW | 8330679-A | 1 | |
| 307 | Screw | XCA6306 | 1 | M3 × 6 |
| 25 | Plate, earth | 8318959-A | 2 | |
| 502 | Board | PEF-476 | 1 | |
| 19 | Bracket, LSW | 8330680-A | 1 | |
| 307 | Screw | XCA6306 | 2 | M3 × 6 |
| 503 | Board | PEF-477 | 1 | |
| 20 | Bracket, LSW | 8330681-A | 1 | |
| 307 | Screw | XCA6306 | 1 | M3 × 6 |
| 504 | Board | PEF-478 | 1 | |
| 27 | Heat sink | 8329720-A | 2 | |
| 308 | Screw | XCA6308 | 4 | M3 × 8 |
| 505 | Board | PEF-479 | 1 | |
| 26 | Heat sink | 8329719-A | 3 | |

| Symbol | Description | Code | Qty | Remarks |
|---|---|---|---|---|
| 308 | Screw | XCA6308 | 3 | M3 × 8 |
| 22 | HV case | 8330683-A | 1 | |
| 88 | Plate | 8340226-A | 1 | |
| 22B | HV plate | 8340247-A | | |
| 67 | Plate | 8340248-A | 1 | |
| 506 | Board | PEF-486 | 1 | |
| 23 | Plate | 8330684-A | 1 | |

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